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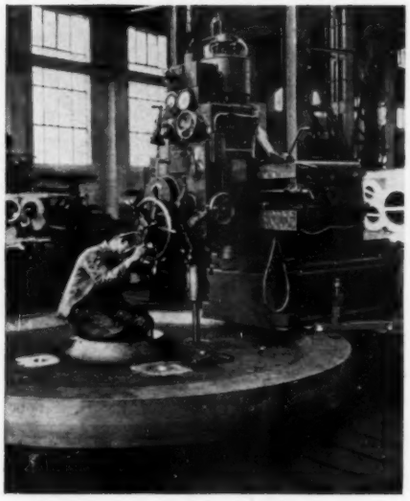

Machines for Mars—While war flares in the Orient, Europe's metal-working shops hum with army orders

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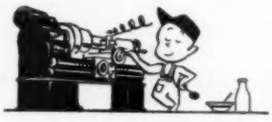
AMERICAN MACHINIST is the preferred paper of production men in the metal-working field

More production men pay to read AMERICAN MACHINIST than any other paper

Talking Shop

How Old Apprentices?

When shall a boy start to learn a trade? No two persons seem to agree. One small manufacturer who takes a real interest in boys, insists that twelve years is the proper age to start. In his experience such boys make better mechanics than those



who start later. On the other hand there are those who say that the advent of improved machinery makes sixteen the minimum age at which they should be considered.

Regardless of the experience of the first employer the trend is away from the younger age. Nothing under sixteen is likely to be considered, for a variety of reasons. And it is quite possible that even eighteen may come to be the age of the beginner. It seems to be up to industry to devise methods of training that will fit the ages it is likely to encounter, and it is quite possible that older boys may be able to absorb information more rapidly. This is likely to be especially true where the boys get some of the fundamentals of mechanics in the public schools.

Cone and Belt Lathes

Perhaps it's all imagination, but there are still users of lathes who believe that a belt drive is necessary to get the best results in turning extra accurate work. In the shop of a well known lathe manufacturer recently, where geared heads made up probably 95 per cent of the output, there were cone head lathes going through at the same time. The users are concerns who do accurate work and who, after trying geared heads, went back to the cone and belt. Some of these same customers want the simplest lathe they can buy, but with the greatest accuracy possible. This brings up the old proposition of so designing a lathe that it can be sold perfectly plain with screw cutting, tapers and other attachments added when, and if, wanted.

Inspection Instruments

Shop managements that buy high class inspection apparatus and then keep it under lock and key make a very poor investment. To be of real value and earn its keep, such equipment must be used every day, in most cases, to check the product that is being turned out.

A recent visit to a well known maker of cutters and tools showed a prodigal use of such apparatus—not only by a few inspectors but by the men making the tools. There were several fine comparators for checking

the outline or contour of the teeth. The man who was making the tool took it to a comparator and checked the shape of the teeth as the work progressed. Huge, master outline charts showed slight discrepancies from perfection with startling clearness. A deviation unseen by the eye looked like a mountain on the screen. These comparators cost real money but they pay for themselves by being used constantly. Instruments that are not used are an expensive luxury.

New Use for Rail Scrap

Worn out steel rails used to be about as useful as discarded razor blades, but technical experts of a Canadian firm have found a way of turning them to profitable account.

Buying these rails as scrap at around $18 a ton—they used to be

quoted at $10 until Japan hoisted the price with its demand for every piece of scrap in sight—the company puts them through its specially devised plant and converts them into grinding balls for use in crushing ore. As the converting process costs about $5 per ton, the factory saves nearly 50 per cent over the price of foundry-made balls at $40 per ton.

Brass Die Casting

Die casting of brass is no longer in the laboratory or experimental stage, judging from some of the products that are being produced by that method. There is still some difficulty with checking of the dies, but the resultant hair line markings on the piece affect its strength not at all, and can be practically removed if necessary by tumbling or sand blasting. For some reason or other we are years behind Europe in the application of this process to brass. Possibly one reason lies in the looseness of our patent laws which permit an alien to protect processes here on a far more favorable basis than is open to an American inventor abroad. At any rate, what can be done over there in the die casting of brass we should be able to do.—*The Editors.*

Industry in Europe

JOHN HAYDOCK
Managing Editor

Following his visit to the Leipzig Spring Fair, the author visited 22 industrial plants in Germany, Switzerland, France and England. Some of the impressions received are outlined here

POLITICS and preparations for war have a strong influence on present-day industry in Europe. In England and on the Continent orders for military needs are directly responsible for long deliveries, ranging up to two years and more, currently quoted by metal-working plants. But while most countries are similar in their high degree of stimulated activity, there are many curious contrasts in the industrial outlook.

In Germany, for example, there is a dearth of certain raw materials. This lack is being overcome by the operation of two major policies. Last September Hitler announced the Four-Year-Plan which has for its objective the development of German materials which can be used in place of those now purchased abroad. German inventiveness is attempting to create products synthetically from materials already available which will not be regarded merely as substitutes, but which can eventually be manufactured as well and as cheaply as those which must now be imported.

Novel Truck Fuels

At the Berlin Motor Show were displayed a wide variety of designs of trucks and buses which do not depend on gasoline or heavier petroleum products for fuel. Coal, tar oil and butane gas are used in these vehicles, and although the combustion equipment is of such size that it cuts down the pay load, the desired end is achieved. Some vehicles equipped with diesel engines are arranged so they can be adapted for other fuels at short notice. Engineering along these lines has for its aim the avoidance of certain raw materials, in this case petroleum, which are not available in Germany.

The other method of correcting the deficiency of certain raw materials is to build up credit abroad by the sale of German products, and by a series of barter agreements in which Dr. Schacht has been exceptionally adroit. So much publicity has been given to Dr. Schacht's maneuvers that little need be said of them here. So far as German production is concerned, plants manufacturing for foreign markets are often given certain preferences, one of which involves the supply of raw materials which are allocated to all German plants. For instance, companies are permitted to use all the steel they need for products that are to be shipped outside the country, but in some instances they are not able to obtain all they need to fill domestic demands.

Probably all the plants visited in Germany, Switzerland, France and England are working on some sort of munitions or other supplies for the military forces. In some cases these products were prominent while in others the visitor was routed around departments devoted to military work. It seems to be a general and logical practice to spread government work so that every plant will have some experience in munitions manufacture. Then, too, these orders often serve as a kind of subsidy in which most concerns are anxious to share.

Plants Protected

One thing that is pretty generally recognized in England and on the Continent is that the next war will be to a large extent an industrial war. With the increased effectiveness of modern aircraft it is predicted that attempts will be made to cripple the enemy's industrial facilities. For this reason, industrial plants are being equipped with bombproof cellars containing gas masks for the workmen and communication and alarm systems. Certain new plants are being constructed on a unit system with the equipment scattered through the various buildings and thus less vulnerable than a centralized set-up. England's "shadow" industries system is being constructed primarily for aircraft parts, each unit supplying certain components and feeding them into central assembly plants.

Repeated references to war and munitions of war do not indicate that the author is an alarmist or that he believes disaster is inevitably ahead of Europe. On the contrary it is thought that a mutual understanding of other nations' problems and the use of a fair portion of common sense can be applied to avert a situation which could not possibly do any of the involved countries any good. The references to the military angle are made simply because they are there and cannot be ignored.

Forgetting the military aspect for a moment, let us take a look at the efforts European countries are now making to restore economic balance and to provide better living standards for their people. For it must be recognized that the ability of these nations to achieve industrial prosperity is one of the best preventives for military instability.

A Nation at Work

Judging from the activities at the Leipzig Trade Fair and in the German industrial plants it must be conceded that Germany is using sound engineering and good workmanship in an endeavor to win back world markets. She is spending every effort to make good products which will attract buyers from abroad. The over-all picture is that of a nation endeavoring to overcome its difficulties by constructive action.

One interesting comment came from the director of a large German industrial plant who had spent many years in America and seemed to have a keen knowledge of American conditions. He explained that the present strong centralized government of Germany resulted from a period of labor difficulties similar to that in which the United States is involved now. He stated that for a period of years, following the stabilization of the Reichsmark and up to the inaugura-

tion of the National Socialist regime, industrial progress was almost impossible in the face of continual labor disturbances. His belief was that the United States is in for a similar period which would be ended only by strong government intervention.

The attitude of most German industrialists is wholesome. They seem to believe that despite the low gold supply of the German people, if they turn their hands to productive purposes as they are doing, they can work themselves out of a bad economic situation. Their problem is further complicated by an acute skilled labor shortage; women, even married women, are being welcomed back into industries in which they are skilled. The government will not let any one group, such as organized labor, interfere with this program, and for this reason, strikes are outlawed in Germany.

Handicapped by States

In France almost the opposite is true. During the Blum administration strikes were frequent, and even during periods of industrial peace, labor seemed to be operating inefficiently. In fact, a spirit of disrespect for authority pervaded the atmosphere from the taxi drivers' back talk to the gendarmes to the small groups of workmen who would gather for a smoke a half hour before quitting time in the industrial plants. If one gets down to basic concepts, industry and agriculture furnish the real wealth of any nation. There is little doubt that part of France's current difficulties is caused by the fact that the people are not getting down to work. It is true that France is not primarily a great industrial nation and that much of her wealth comes from the industry of her small farms.

A Significant Contrast

The left wing of French political thought which was in the saddle under the Blum government is a strong upholder of what we call collective bargaining. However, the interpretation placed on it seemed to be encouragement to strike frequently and to gain all concessions possible. Workmen in France have a 40-hour week and vacations with pay, but still are not content. The cycle of strikes tends to force prices higher and higher which results in a new series of disturbances in a vicious cycle. The situation is a contrast to the German method of sticking to business and keeping prices down. Before the Paris Fair opened it was generally conceded that it would not be ready on schedule. The only buildings that had a chance of opening on time were those being erected by Germany, Italy and Russia. These were being expedited by working overtime and on Sunday. Those being constructed by the French were continually delayed by strikes. With a new government in the saddle these conditions may be improving.

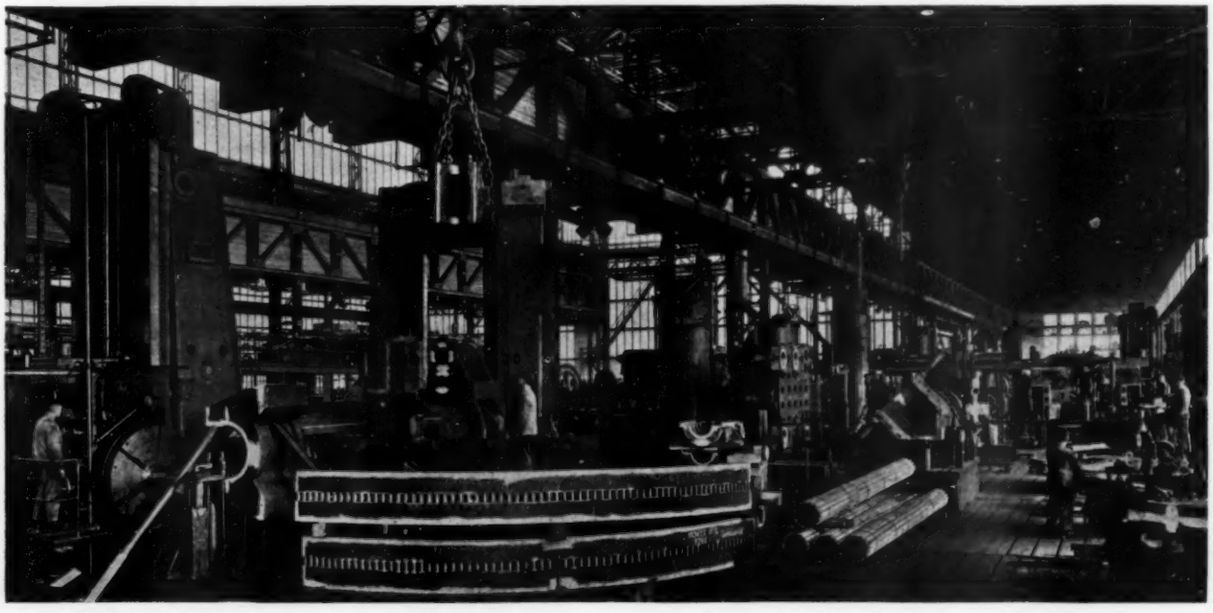
Switzerland this year is having a belated recovery which was delayed until the devaluation of the Swiss franc. About 90 per cent of Switzerland's industrial output must be shipped abroad since the completion of the Swiss railroad electrification. Prior to the currency change, Swiss prices were so much higher than those of their competitors that the market for capital goods abroad was restricted. Even now in many cases Switzerland gets a higher price for its machinery output than do other countries. It is a tribute to Swiss engineering and workmanship that her plants can compete successfully even when this differential exists.

England Rearms

The English have come to a belated realization of their mistake in relying too strongly on the League of Nations. They are now endeavoring to make up for lost time in their rearmament program. Practically all English plants are making contributions to armament in one form or another. During the first six months of 1937, 38 new companies were formed in England for the purpose of making aircraft equipment.

All of these countries seem strong in their desire for peace. Industrialists would like to accept pacific statements made by political leaders at their face value because right now they are in a prosperous period. Despite all the restrictions under which they labor, they are making progress in furnishing an improved standard of living. If they obtain as well a greater mutual understanding of their neighbors' problems they may succeed in dispelling some of the clouds that now overshadow the European horizon.

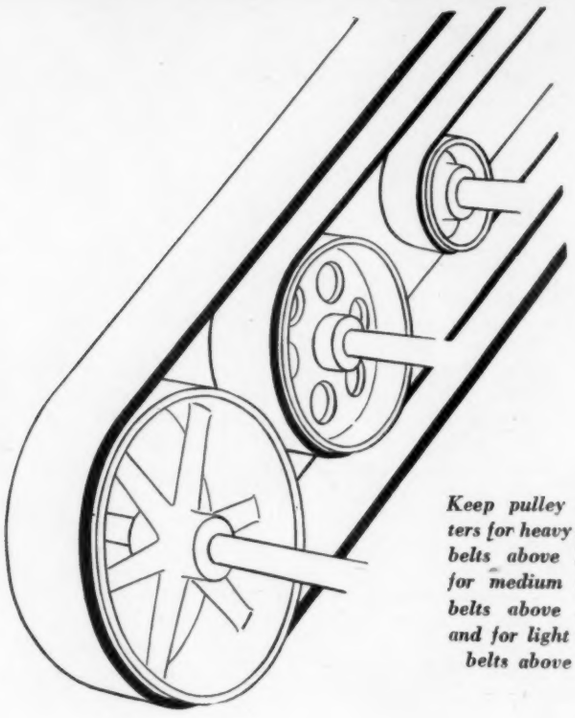
Plants abroad are turning out products for peace and for war. Will improvements in living standards offset the economic instability inherited from the Treaty of Versailles?



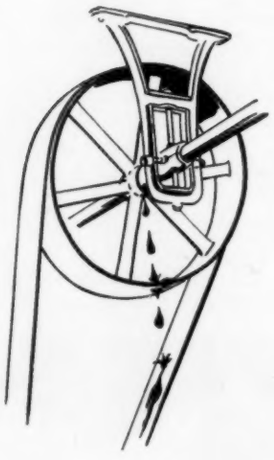
How to S-t-r-e-t-c-h Belt Dollars

FRED MERISH

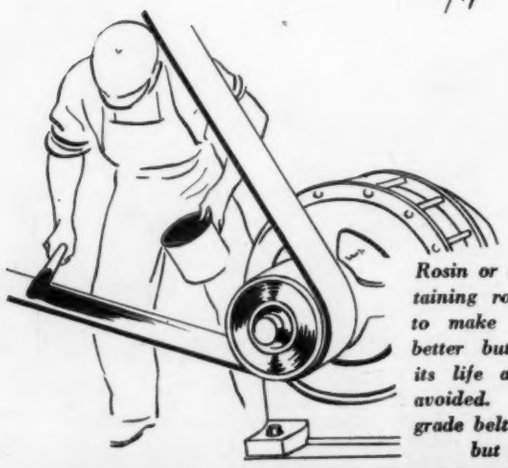
Factory and mill superintendents have passed along the following belt life-savers, which may help other plant executives in preventing profit slippage



Keep pulley diameters for heavy double belts above 16 in., for medium double belts above 10 in. and for light double belts above 5 in.

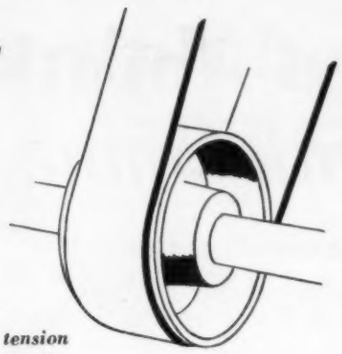


A clean belt lives longer, so keep away dust and oil, particularly on the side against the pulley

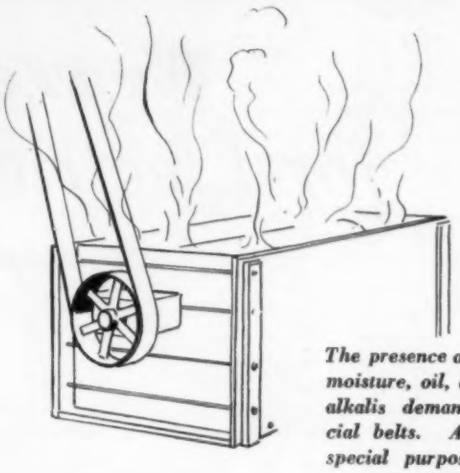


Rosin or a dressing containing rosin may seem to make a belt drive better but will shorten its life and should be avoided. Use a high grade belt dressing often but sparingly

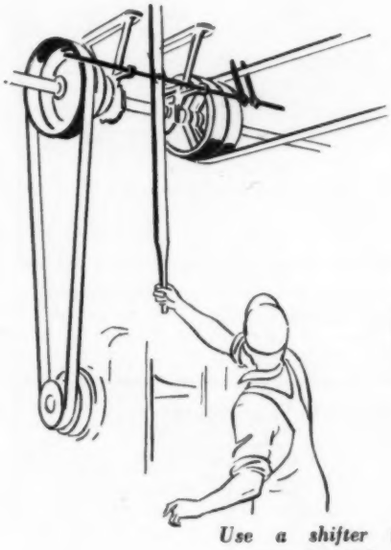
Too much tension in a belt pulls the shafting out of line, burns out bearings and lowers power transmission



Use a belt ¼ to ½ in. narrower than the face of the pulley to protect the edges and insure longer life

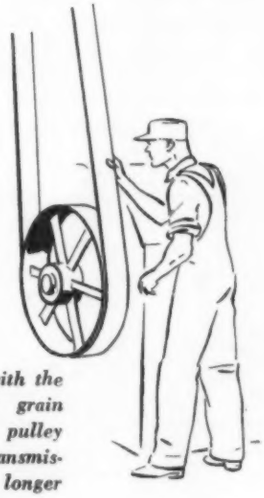


The presence of steam, moisture, oil, acids or alkalis demands special belts. Also use special purpose belts possessing high tensile strength, better pulley adhesion and greater flexibility where small pulleys or idlers are necessary

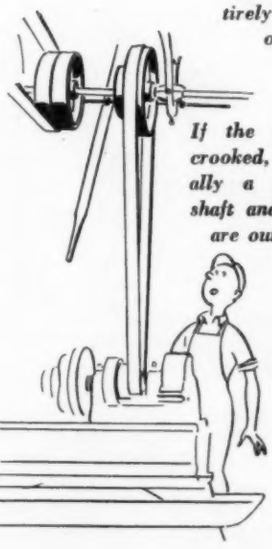


Use a shifter that throws the belt entirely off or entirely on the pulley

Examine belts periodically; make repairs promptly; use a high grade belt cement



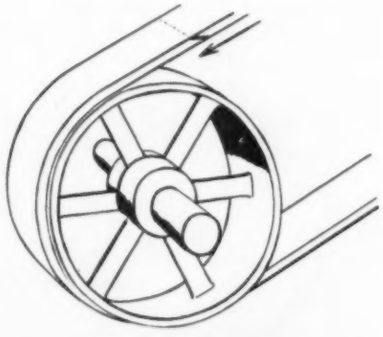
Run a belt with the smooth or grain side to the pulley for better transmission and longer service



If the belt runs crooked, it is usually a sign that shaft and machine are out of line

Slippage puts an extensive strain on a belt, bearing and shafting, wastes power, increases lubrication costs, shortens belt-life, causes breakdowns, decreases production and profits. Buy first quality belts and use good belt dressing

Run the lap of the belt away from the pulley, otherwise the point of the lap may open up. To increase the arc of contact and transmit more power drive from the bottom of the pulley



Brazed Joints *for Electrical Connections*

WILLIAM J. HART
Mechanical Engineer, Sharon Works,
Westinghouse Electric & Manufacturing Company

Brazing with relatively low-melting-point alloys is useful where electrical connections must be made in close quarters

CONSIDERABLE electrolytic, deoxidized copper is used in the fabrication of equipment by the electrical industry. In many instances, joints connecting copper cables, straps and similar parts must be made in close quarters, often near inflammable insulating material. Welding these joints would be likely to damage this insulation, because of the amount of heat required.

Brazing copper joints with relatively low-melting-point alloys is not new, but the technique of making brazed joints has been much improved in recent years. Brazing, frequently confused with other processes, such as tinning, sweating, soldering and welding, is the art of joining metal parts together, without fusion, by the application of a metallic brazing alloy, flux for cleaning the surfaces and heat to the metal parts.

The Ideal Joint

An ideal brazed joint requires the minimum of preparation, is designed to use the least amount of alloy and is capable of meeting inspection requirements. There are a number of commercial grades of brazing alloys, ranging from the common solders, which melt at about 400 F., to the higher alloy materials which require a temperature in the neighborhood of 1,500 F. and develop higher joint strength. Some of these alloys require a flux and some do not, since the phosphorous included in some alloys is a sufficient fluxing agent for copper details.

A number of heat-sources may be used to bring the joint to brazing temperature. Among these are: oxy-acetylene, controlled-atmosphere furnaces, ordinary furnaces and the incandescent carbon. The advantage of heat-control, eliminating to a large extent the danger of overheating the copper, has led to selection of the last named method in much of the work that has been done in applying brazing to the making of joints in copper circuits. Proper temperature is indicated by the melting of the brazing material and overheating of parts can be easily avoided. It is possible to clamp the work between the carbons and adjust the brazing material before heat is applied, insuring properly aligned joints.

Improvement of brazing practice

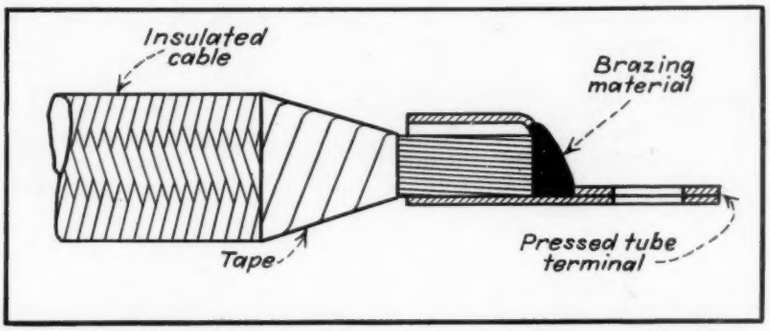


Fig. 1—Only superficial inspection is possible with the pressed-tube joint, and the large section of brazed material is likely to be brittle

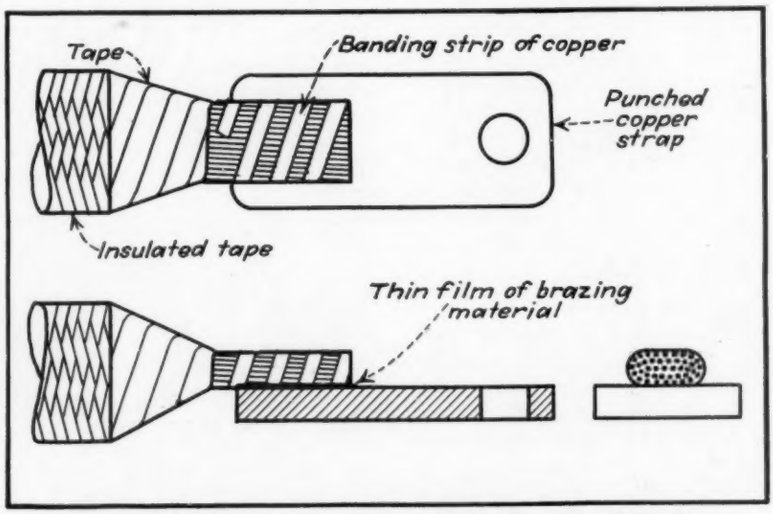


Fig. 2—This joint consists of a punched copper strap brazed to the flattened cable end. The large area brazed insures a strong joint and the open construction permits thorough inspection

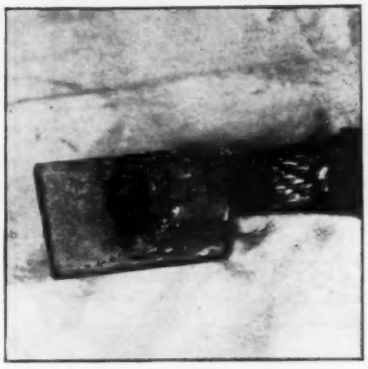


Fig. 3—Sample cable joint brazed in bench fixture shown in Fig. 4 is economical to produce and possesses the required mechanical strength

has led to improvements in joint design, with resultant manufacturing economies. An illustration of the trend in joint design, made possible by the development of brazing methods and equipment, is seen in comparing the joint in Fig. 1 with that in Fig. 2. These connections between cable and terminal also illustrate the possible reduction in amount of brazing alloy used in each joint through the exercise of care in design. The joint shown in Fig. 1 requires a pressed-tube terminal and a large section of cast alloy. Amount of brazing material used for this joint is sufficient to make several joints of the improved design. The large surface brazed in Fig. 2 produces a stronger and more flexible joint, owing to the elimination of the large cast section, which is inclined to be brittle.

Flat Terminal Better

Relative costs of the terminals are obvious—the pressed-tube terminal must be made from tube material and a hole must be cut to permit entrance of the brazing material, whereas the flat terminal used in Fig. 2 is punched from strap stock in one operation. Brazing of the pressed-tube terminal is done with a torch which, if not properly handled, will burn the fine cable wires and will deposit brazing material on the bottom of the terminal without adhesion to terminal or cable.

In the joint in Fig. 2, a thin shim of brazing material is placed between the flattened cable-end and the strap. Brazing, done by the incandescent-carbon method, can be accomplished without over-heating and burning the wires. Cable strands are sealed together by holding a small rod of brazing alloy against the end of the cable. Capillary action causes the molten material to flow between the cable strands during the brazing operation, thus making a solid joint.

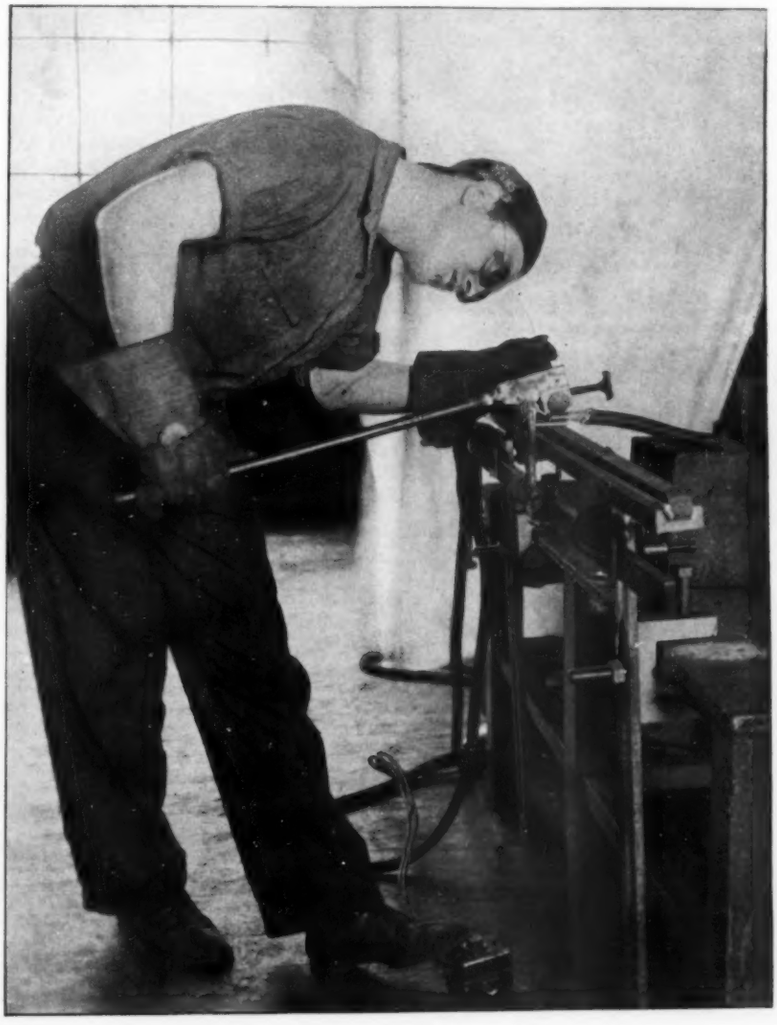
A sample joint of this type is shown in Fig. 3. This joint was made during the development of a bench-type brazing fixture, Fig. 4, in which terminal assemblies are layed on the carbon block and the hand operated clamp, having a carbon insert, is closed before the heating circuit is closed with a floor-type switch. Here the operator is seen using a small rod to fill the cable strands with brazing alloy.

Brazed joints used in making connections to strap leads are shown in Fig. 5 and Fig. 6, the latter being the better joint. The large fillet shown in Fig. 5 should be eliminated because the extra brazing material is not required to make a strong joint and it produces a mass which, upon being stressed, may crack and break through the plate. A minimum of brazing material is used in the joint shown in Fig. 6.

Brush copper has always been difficult to braze to other members, as the thin section tends to burn away before the brazing material has been properly melted. By using a heating plate next to the brush copper, the incandescent-carbon method may be employed to heat the copper. Brazing can then be successfully accomplished by inserting thin shim material between the leads or by using a small rod, feeding it in at the exposed edges. Capillary action will cause the fluid rod-material to soak several inches back from the edge of the brush copper—making a satisfactory bond.

In attaching cables to plates it is

Fig. 4—In the development stage of this bench brazing fixture the heating circuit is closed by operation of the floor-type switch after the joint is clamped between the electrodes



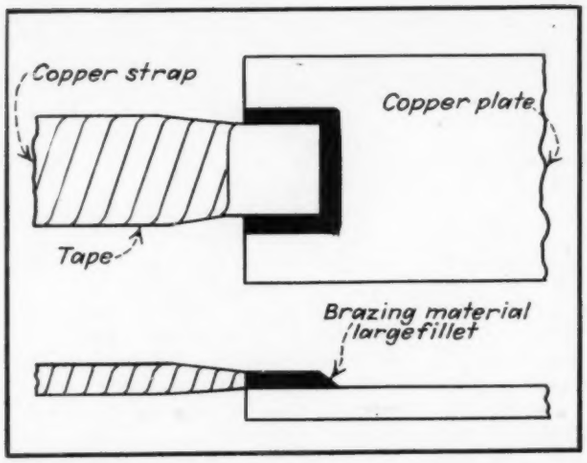


Fig. 5—In this strap copper lead, assembled to copper plate with a "fillet" braze, the material in the fillet has a tendency to crack upon being stressed

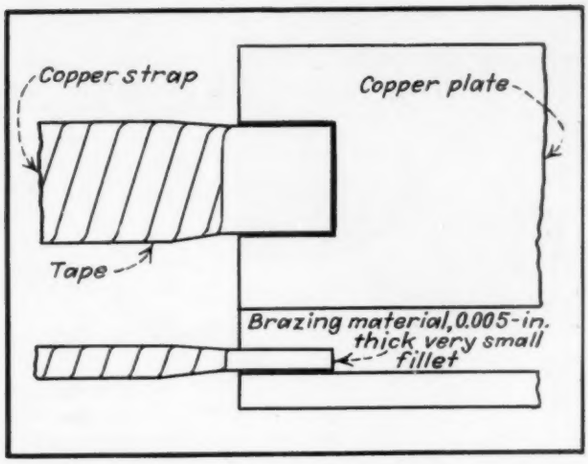


Fig. 6—In making this strap-to-plate connection for incandescent-carbon brazing, a sheet of brazing material is placed between the two parts

necessary to wrap the base end of the cable with fine wire or strap, as in Fig. 2, to hold the strands in place while the end is flattened by hammering. This operation provides a large bearing surface for the joint. A thin film of brazing material, not more than 0.004 in., is all that is necessary to develop full strength in brazed lap joints, providing the overlap is properly designed; this should, ordinarily, be three times the thickness of the thinnest section of the finished joint.

Fig. 7—This portable brazing unit is used for making permanent connections in small transformers by the incandescent-carbon method. The 10-kva. transformer is mounted on a wheeled carriage and is provided with a tap-changing device for voltage control

The secret of the successful brazing of copper is to complete the joint as quickly as possible and with the lowest possible heat. Photomicrographs of cross-sections of brazed joints show that excessive heat produces large grain size, an objectionable feature.

It is also advantageous to use a brazing rod that has a small amount of phosphorous to act as a fluxing agent. Certain types of prepared fluxes have been found to dry out between the joints, insulating them sufficiently to interrupt the flow of current from one carbon to another. There is danger of trapping the flux and leaving unbrazed areas in the joint.

Joint efficiencies, in normal atmospheric temperatures, depend upon the amount of overlap, in the case of a lapped joint, or on the brazing alloy used, in the case of butt joints. There is a marked reduction in joint efficiency at temperatures only a little above normal. This is an inherent weakness of the brazing alloy and not of the parent metal. Little can be said about joint efficiencies without consideration of amount of overlap in the joint and the maximum temperature to be encountered during the life of the joint.

Efficiency of the joint is dependent upon the thickness of the joint. A thin layer of brazing material, up to 0.003 in., is economical and has a high shear value. If it is, for example, $\frac{1}{32}$-in. thick the shearing action between members is changed to a couple and bending takes place in the brazing material. Consideration of complications due to large, cast sections are also in order when this condition exists in electrically brazed joints.

Taper Tooling

JOHN MARK MAY

THE EXPENSE that one is justified in using when tooling up for a new model or an additional size is often hard to determine on a product that cannot be reasonably expected to reach large sales.

In a shop where taper fits were required for many of the parts made in the manufacture of its product, a medium sized firm found that a practical method of producing the holes when a new size was required, the demand at the time usually being for only a few, was to bore them with a single-point tool held in a bar.

Later when the requirements were somewhat greater a reamer was made for finish sizing.

Still later, when the requirements were for larger lots, multiple cutting tools for boring were made. Following this step the reamer required regrinding, and at this stage to maintain interchangeability, gages were required; finally when the production became so large that wear was beginning to show on the gages, master gages were made for the job.

Facing Fixture *for Submarine Liners*

Filing and scraping of liners has given way to a much faster air-driven facing head

ARTHUR SILVESTER

STEEL LINERS play an important part in the construction of every submarine. They are welded to the inner shell of the hull or into a bulkhead as shown at *B*, Fig. 1, to permit attachment of pumps, valve bodies, and auxiliary mechanisms. These liners vary in diameter from 3 to 12 in. and several dozen are used in every undersea craft.

The face of a liner must be smooth and flat, but welding it in position causes warpage. To overcome this, a machinist used to take from eight to twelve hours to file, scrape and fit the liner to a surface block. That is why this fixture was made. A good man now can face six to seven liners a day.

Construction and operation of the fixture are simple. A framework of strip steel and angle iron is tackwelded to the bulkhead. The bottom strips have slots to allow the fixture to be moved forward or backward. After the fixture is placed in the framework, a setting piece, Fig. 2, is placed in the split bearings instead of the facing head shown in place in Fig. 1. When the face of the setting piece is square with the face of liner *B* to be machined, the fixture is bolted down. First, however, the four setscrews at *C* must be in contact with the frame to prevent the fixture from shifting.

The setting piece is then removed and the facing head substituted. As will be seen, the fixture is driven by a compressed air drill. To get the correct speed on the tool it was necessary to use a gear reduction of 6 to 1.

The tool is set by hand, and roughing and finishing cuts are required. Feed is put on by turning the handle while the cutter head is revolving. After the liner is finished the fixture is removed, and the supporting frame is chipped off and used over again. Eye-bolts are provided for the top half of each bearing to assist in removing and replacing them.

Without welding, this fixture could not be used because it would be necessary to drill and tap holes in the bulkhead or hull. Government inspectors will not allow this. In addition, the cost would be too high.

Fig. 2—A setting piece is used to align the fixture with the liner face

Fig. 1—A steel frame work is tackwelded to the hull, a setting piece inserted to line up the facing fixture, and then a facing head is substituted to finish liner *B* in a short time

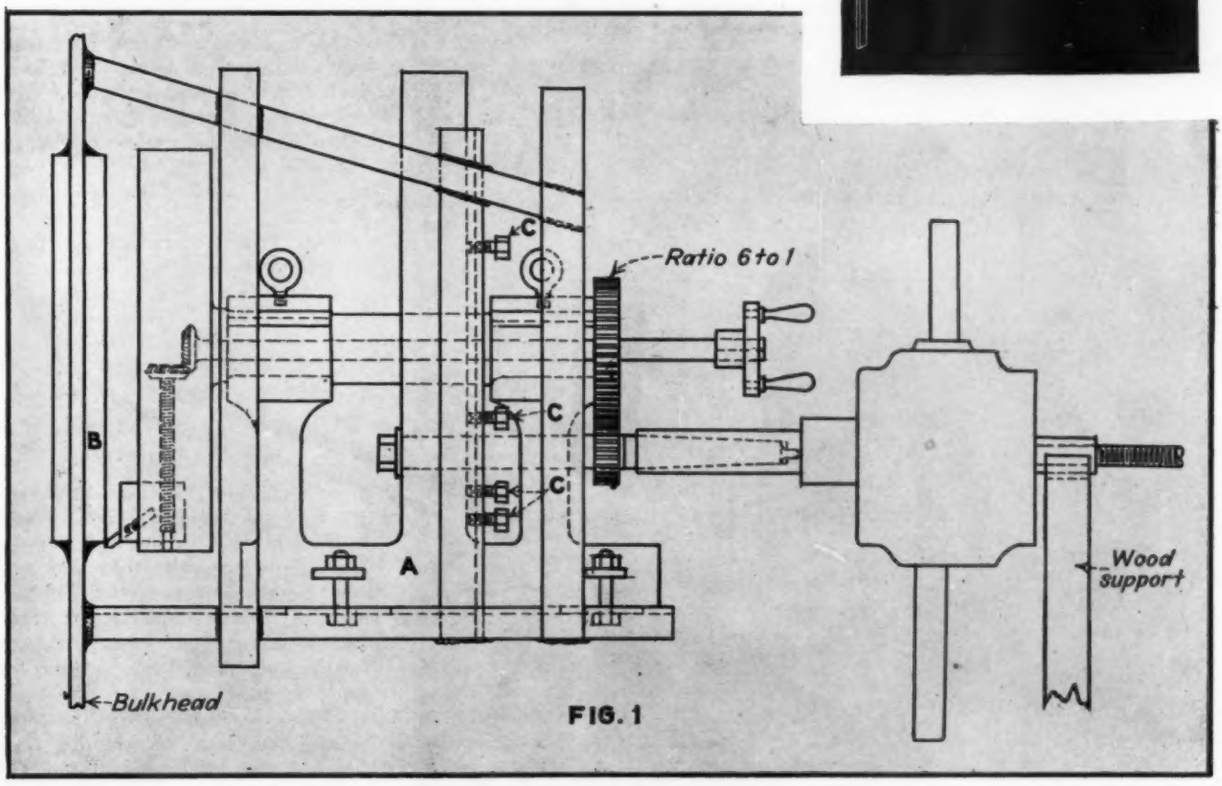


FIG. 1

No Clerks *in This Shop*

Daily meetings of foremen and a new communication system eliminate clerk and messenger delays

IN MOST SHOPS, production is controlled by means of a central planning and scheduling department based on shop timekeepers and clerks through a plant messenger service. Foote Bros. Gear and Machine Corporation, retains the central control but avoids much of the red tape by the use of a simple communication system and by a change in the foremen's duties.

Gear making is a special order business to this concern; accurate estimates and bids are the foundations of profit. Cost changes that occur in production must be caught quickly to insure the predetermined margin of profit. In the plan explained here, any variations from normal are noted immediately; the factory manager and the foreman apply remedial measures at once.

Production control is placed almost entirely in the hands of the foreman, because he possesses accurate and timely knowledge of conditions in his department. To transmit this information to a central scheduling department by way of the shop clerk and messenger introduces red tape and slows production.

It is generally contended that a central planning and scheduling division is necessary because the foreman does not have available all the facts regarding the other departments' work. Decisions which seem satisfactory to him may have detrimental effects on other departments or on the customers' welfare.

This factor has been abolished by the use of a daily meeting of the factory manager, production men and foremen. All the records are at hand at this meeting. Each foreman has a copy of his latest schedule sheet and is prepared to put in new dates, delivery promises and to cross off finished operations.

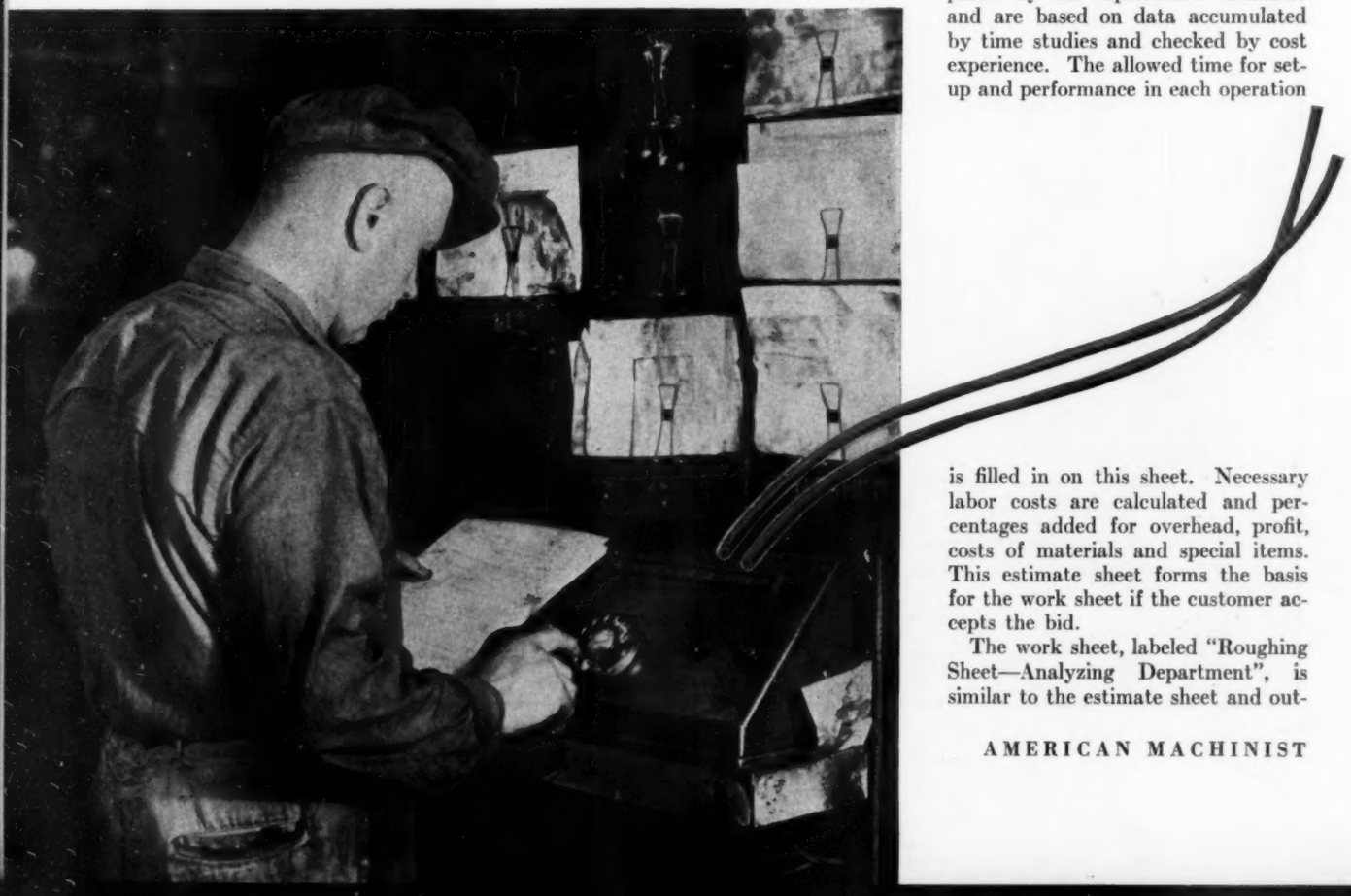
While this plan may increase the duties of the foreman, supervision can be sub-divided to such extent that the foreman need not be overloaded. To handle the 300 men employed in this factory, the factory manager is assisted by three production men, who keep the necessary records and attend to follow up, and three general foremen. The general foremen in turn are assisted by working foremen, each responsible for a department and each dividing his time as necessary between supervision and production.

It is even probable that demands on the foreman have been reduced by allowing him to make his own plans without the formality incidental to central scheduling. At the same time he feels a greater sense of responsibility and has freedom to accomplish results in his own way.

When an estimate is requested by a customer the job is analyzed on an estimate sheet. These sheets are prepared by an experienced estimator and are based on data accumulated by time studies and checked by cost experience. The allowed time for set-up and performance in each operation is filled in on this sheet. Necessary labor costs are calculated and percentages added for overhead, profit, costs of materials and special items. This estimate sheet forms the basis for the work sheet if the customer accepts the bid.

The work sheet, labeled "Roughing Sheet—Analyzing Department", is similar to the estimate sheet and out-

Workman notifies central station that he has just completed one job and is beginning another



Production clerk receives information, marks time cards. Work orders sheets are visibly filed near central board

lines the operations, the tool used, and the standard time allowed for set-up and for operation. A hektographed master copy is prepared from this "Roughing" sheet and reproduced in sufficient number to supply each department concerned with a copy.

The original is folded and filed by the production man in a visible card file. The back of this order contains columns for the entry of labor costs, and for a record of follow-up of purchase orders and deliveries. When the latter are complete the job is started through the shop with one copy of the order accompanying it. When a job reaches a department, the foreman assigns it in the order of importance. This has been established in the daily meeting with the factory manager.

At this point the second important feature of the plan enters in. When the individual operator starts a job he indicates this to the production clerk by means of the communication system which is the heart of this cost control plan. Dialing stations which operate like a dial telephone are placed in each department. These are connected to a central board in front of the production man. Dialed information appears on a register on the central board.

Having signaled the clerk, the workman dials his own number, the number of the job just completed and the quantity made. He then dials the number of the job on which he is just starting and the number of his machine or production center. As these details appear on the central board, the production clerk writes up the new job on a blank time card taken from the register in front of him and stamps the starting time.

He takes the time card for the completed job from the file, stamps the finishing time, enters the quantity completed and the allowed time for the number of pieces finished. If there is a substantial and unfavorable difference between the estimated and the actual time, he notes this on an extra copy of the production order. This is forwarded at once to the factory manager from where it is sent to the foreman involved. The foreman may then check immediately as to the causes for unusual delay in the finishing of work and may save costs on the remainder of the pieces. (It is estimated that some 85 per cent of the jobs are completed without special supervision or detail production control.)

Meanwhile the production clerk posts the details of the completed operation on the back of his work sheet file copy which is in the visible file next to the central station. This provides both a cost summary and an up-to-date progress record.

The time card is in triplicate. One copy of it is a standard tabulating machine card. These go to the tabulating department which punches them in accordance with the data and makes up all the reports and analyses needed for the company. Each week the factory manager receives a report which summarizes the total actual time against allowed time for the week by production centers and departments. These reports may form the basis for revision in estimates or a change in production procedure.

CUST. ORDER NO. & DATE
REQUISITION NO.
CONTRACT NO.
ORDER NO.
SOLD TO
DATE REC'D
ENTERED
SCHEDULED

Form OF-199
ESTIMATE SHEET
REGISTER No......

ITEM	PARTICULARS	QUANTITY ORD.	QUANTITY SHIPS.	MAT.	KIND OF GEAR	NO. T	PITCH	FACE	BORE	LENGTH OF HUB	O. D. D.	D. D.	K. D.

MACH. GROUP NUMBER	OPERATIONS	TOOLS	MACH. HR. RATE	NO. PCS. TOTAL HRS.	NO. PCS. TOTAL HRS.	NO. PCS. TOTAL HRS.
	1					
	2					
	3					
	4					
	5					
	6					
	7					
	8					
	9					
	10					
	11					
	12					
	13					
	14					
	15					

TOOLS		TOTAL COST	$	$
PATT.		COST EACH		
ENGR.		BURDEN MARK UP $		
		LABOR & BURDEN		
NOTES.		PROFIT MARK UP $		
		LABOR SELLING PRICE EACH		
		MATERIAL EA. ADD. $		
		HEAT TREAT ADD. $		
		MISC. ADD. $		
		SELLING PRICE EACH		

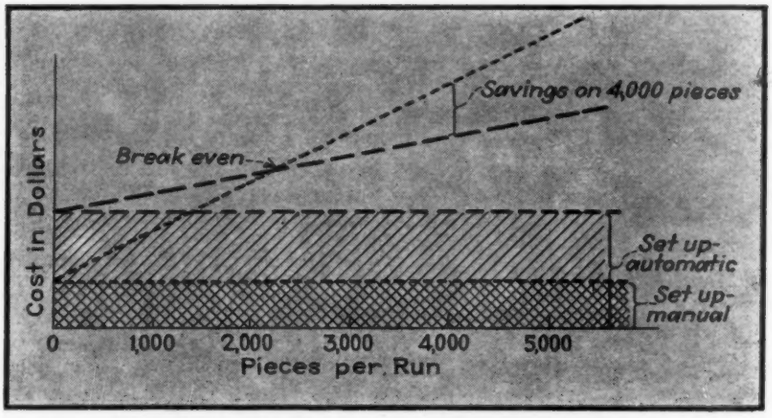
The estimate sheet for bidding is similar to and is basis of the job operations sheet

Charts for Economic Lots

WHETHER TO USE an automatic or a manually operated machine is a question that often arises in metal-working plants. Usually the automatic machine will take longer to set up but consumes less time per piece. The manually operated machine or the semi-automatic machine may take longer for each part turned out after the cycle has been started, but eliminates a lengthy setting-up operation. To crystallize the various factors involved in comparing two or more types of machines, a graphic analysis is often helpful.

For instance there is the kind of chart of which that illustrated is an example. This chart is used by the U. S. Tool Company, Inc. to indicate whether a punch press or a U. S. Multi-Slide automatic is more economical in producing a certain run of formed metal parts. It will be seen that the general procedure is to mark off two horizontal lines representing respectively the set-up time for two types of machines. From these, sloping lines are drawn to show the cost of producing a number of pieces by each of the two methods.

For the particular case illustrated, the manually operated machine gives a lower total cost up to about 2,200 pieces at which point the two lines cross. Larger quantities, the chart indicates, are more economically produced on the automatic machine despite the higher set-up charge. At 4,000 pieces, for instance, the saving is represented by the vertical distance between the two sloping lines.



Superimposed charts for manual and automatic operation give a good comparison of costs

Such graphical analyses are not limited to the factors shown in this example. If tooling charges are to be absorbed in a single run, they may be included with the set-up cost.

The charge per piece on which the slanting lines are based may include machine-hour rates determined from initial cost and rate of depreciation rather than merely upon direct labor. In other cases, the coordinates may be a function of time rather than the number of pieces completed. In short, the chart is a general method of approach to the problem of economic production and can be varied to suit the particular question under consideration.

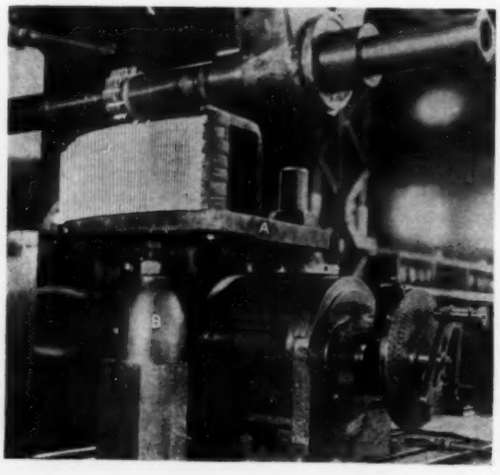
Seven Quadrants—One Stack

HENRY C. FRANKLIN

AN UNUSUAL method of using a dividing head on a milling machine is found in the Sayre, Pa., shops of the Lehigh Valley railroad. The job is notching the quadrant for a locomotive throttle, which has comparatively fine teeth. These are evidently made in fair-sized quantities, as seven of them are stacked on the machine shown.

The spindle nose of the indexing head is turned up in a vertical position and a steel plate *A* is fastened to it by a nut. The outer end of the plate *A* is supported by the jack *B*. This prevents sag of the plate and the work, which would strain the spindle, and also takes the thrust of the cut as the cutter feeds down through the seven quadrants. Straps are provided for holding the work in place on the plate.

With the plate swung so as to bring the gang cutter at the end of the quadrant, the cutter is moved into the proper depth and the work fed up against the cut by the elevating screw in the knee of the machine. After completing the cut the table is moved down to the starting position and the plate *A*, carrying the work, is swung around by the index head into position for the next set of grooves. The index head makes it easy to space the notches at the proper distance. The jack, always directly under the cutter, supports the work and fixture against any deflection, regardless of the position of the plate.



A dividing head comes in handy for turning out gear segments in a railroad shop

Ideas from Practical Men

Three-Stage Press Tools

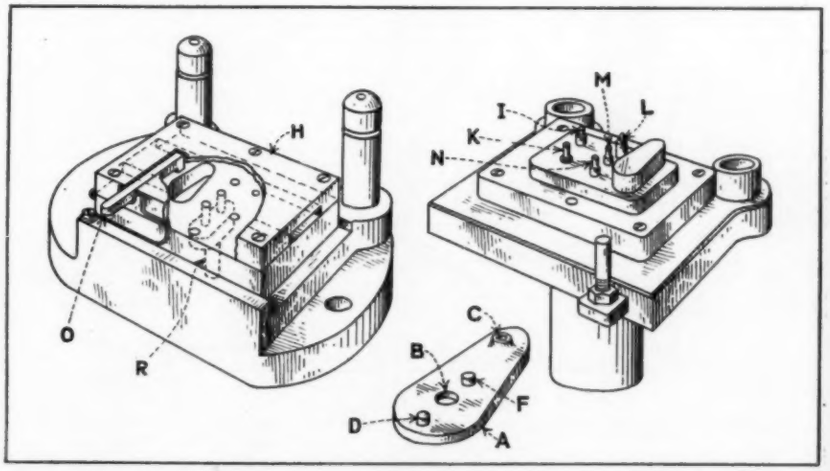
CHARLES H. WILLEY
Superintendent of Manufacturing
Hoyt Electrical Instrument Works

In the illustration are shown three-stage progressive press tools for producing the dial support *A* in large quantities. The part is made from ¾-in. hard-rolled brass strip. Two holes *B* and *C* are pierced, the metal around hole *C* being afterward extruded. It also has two teats *D* and *F* extruded to project at least ⅜ in. above the surface.

The strip stock is fed through the guide stripper *H* and as the ram descends the holes are pierced by punches *I* and *K*. The strip is then advanced and as the ram descends the work is located by the pilot on punch *L* which extrudes the metal around hole *C*. At the same time the two punches *M* and N are forced part way through the metal and extrude the teats *D* and *F*. The strip is then advanced to the trip stop *O* and as the ram descends, the part is blanked.

It will, of course, be understood that in the last two stages the small punches operate on the strip behind the piece being blanked, and that after the first piece has been blanked, one finished piece is produced at each stroke of the ram, the trip stop spacing the work.

To eject the part after the teats have been extruded and to permit easy advance of the strip, the ejector *R* is used, being placed below the die and operated by springs from below. The extruding punch *L* carries the work upward as the ram ascends and it is stripped from the punch by the guide stripper plate which tends to keep it flat.

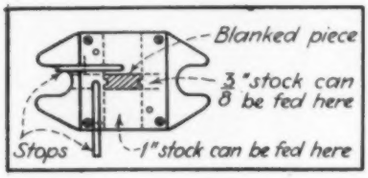


These simple three-stage press tools produce small and rather difficult work in large quantities. One finished piece is produced at each stroke of the ram

Stripper Takes Two Stock Widths for Same Part

GORDON W. RICHARDS

One concern has found that it can often save money as well as time by making stripper-plates for blanking dies so that two sizes of stock can be fed to the die. Thus, if one stock size is not at the moment available or isn't conveniently at hand, the other size can be used. This is done by slotting the stripper-plate from both sides and then turning the die as desired.



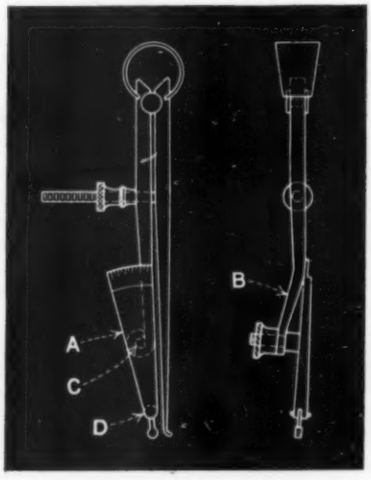
Inside Calipers With Indicator Attachment

THEODORE KRUGER

In the illustration is shown a pair of inside calipers having an Ideal indicator attached to one leg. An eye *A* is bent in one leg for the screw for attaching the indicator and the leg is bent in an offset at *B* so that the point of the indicator will be in alignment with the point of the opposite leg.

Holes from ¼ in. up to the limit of range of the tool can be easily and closely measured. Adjusting points at *C* and *D* are convenient features. The tool is neither heavy nor clumsy and should be a welcome addition to

Inside calipers fitted with an Ideal indicator can be used for close measurements of holes from ¼ in. up to the limit of the tool



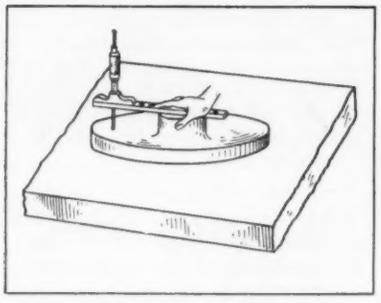
the kits of tool and diemakers. I have used such calipers for years for measuring holes in tool and die work where close boring was necessary.

Extension Bar for the Micrometer Depth Gage

BRUCE MacINTOSH

In measuring the hub projections of gears, pulleys and similar work, the work is often so large as to be beyond the range of the depth gage, due to the shortness of its base.

For such cases an extension bar is



The extension bar for the micrometer depth gage enables the tool to be used for measuring the hub projections of gears and pulleys

easily made from $\frac{5}{16}$-in. square steel drilled at 1½-in. intervals to permit the measuring rod to pass through, the drilled surfaces being afterward ground to bring the bar to ½ in. in thickness.

In use, with the work on a surface plate, the extension bar is firmly held on the flat face of the hub and the depth gage is placed as far out on it as necessary for the measuring rod to contact the rim of the work, as shown in the illustration. Measurement is taken to the rim of the gear or pulley, ½ in. being, of course, deducted from the reading.

Shoe and Wedge Fixtures

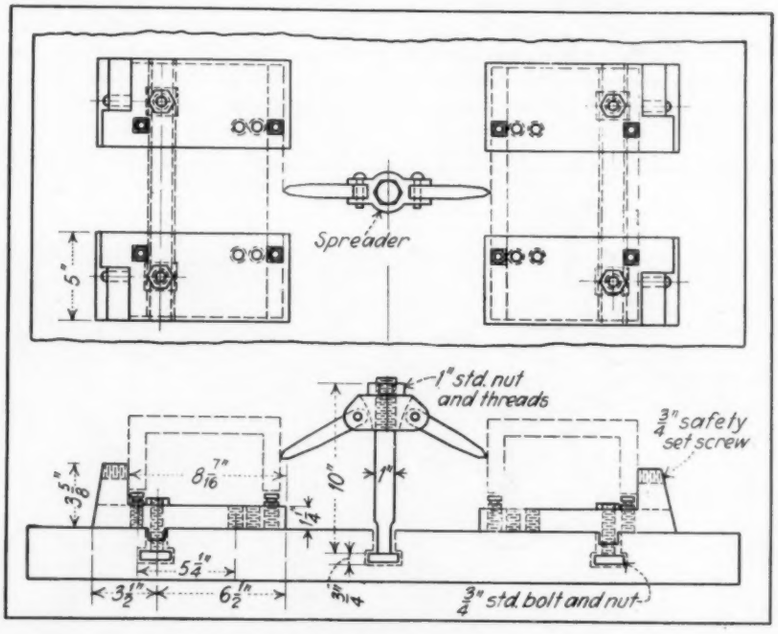
CHARLES F. HENRY

Shoes and wedges are always planed in lots or strings, using suitable fixtures. By the method shown in Fig. 1, 32 bases and 16 spreaders are used to handle 16 shoes, or wedges, at one set-up. Details are given in Fig. 2, which show how three widths of shoes, are handled in the same fixture.

Referring to the details the bases are made of open hearth steel, planed in the L-shape shown. Safety set screws act as button contacts for the outer side of the shoes, and ¾-in. jack screws are provided to support

the edges of the work. Holes are tapped so that the inside jack screw can be moved into two other positions for narrower shoes or wedges. The widths vary in this case from 6- to 8½-in.

Two bases are used per shoe and two spreaders, or clamps, are used on each screw, as seen in Fig. 1, although the plan view of Fig. 2 shows only one. The use of a clamp, at each end of the work, holds it more firmly and tends to seat the shoe against the contact points. The clamp bolts can be readily moved to desired positions. Clamp arms are made in varying lengths, from 4½- to 5¾-in. each, to suit different widths of work. In this way a similar angle of pressure can be exerted on the work, tending to force it down as well as against the outer locating points.



Two bases are used for each shoe, or wedge, and also two clamps, although only one is shown

A Tube Grooved Internally

C. D. MICHENER
Diamond Drill Contracting Company

Six internal grooves were to be cut lengthwise in a tube 5 ft. long by $\frac{13}{16}$ in. internal diameter. These grooves were to be $\frac{3}{16}$ in. wide by $\frac{3}{64}$ in. deep. First we tried to do the job in a lathe, using a hydraulic cylinder to pull the tool. This proved too slow, the time being about 6 hr.

Then the rig illustrated was developed. A T-rail overhanging the bed of a planer carried an end plate to which a pull bar, or cutter bar *A*, was fastened. Cutter head *B* was screwed on the other end as shown, the thread being an easy fit for quick removal. Another plate *C* was fixed to the tool box on the planer head, and fitted with an indexing sleeve, *D*. On one end of the tube to be grooved was welded a collar *E*. Collar *E* was held against the index plate and sleeve *D* by set collar *F*. The setscrew in set collar *F* goes through the sleeve *D* and against the tube *H*. This leaves the tube *H* free to revolve in plate *C*. An index pin, not shown, engaged the notches in *D* and fitted into a hole in plate *C*. The other end of the 5-ft. tube needed no support.

To start proceedings, the cutter bar without the cutter head was run through the tube, the cutter head attached, and the whole pulled through the tube. Cutter head *B* was then unscrewed, the chip plug *K* substituted, and the bar passed through the tube in the reverse direction to clear out the chips. The chip plug was then unscrewed, the cutter head replaced and the tube indexed to the next position. After every six passes the cutter *I* was adjusted. Time for the entire operation was 2½ to 4 hr.

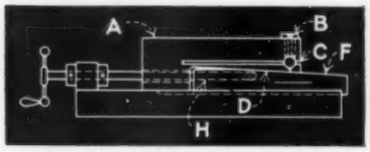
Jig Clamp for Small Round Work

JOHN E. HYLER,
R. G. Le Tourneau, Inc.

Small round work is often troublesome to hold for drilling crossholes without spending too much time in clamping it in position. Having to do a large quantity of work of that kind we made the device illustrated.

To the base is attached the clamping block *A* having a hole in which the work is held and carrying the drill bushing *B*. The block is slit at *C* so that it can be sprung to hold the work tightly and is undercut at *D* to the same taper as that of the wedge *F*. The wedge is fitted into a groove in the base to guide it as it is slid under the tapered part of the clamping block by turning the screw *H*. Moving the wedge in the direction of the arrow springs the lower part of the clamping block upward and holds the work tightly.

As shown, the clamping block is attached to the base by welding. If it were attached by screws it could easily be removed and blocks for other sizes put in its place. Clamping blocks of this type can be made for holding other shapes than round.



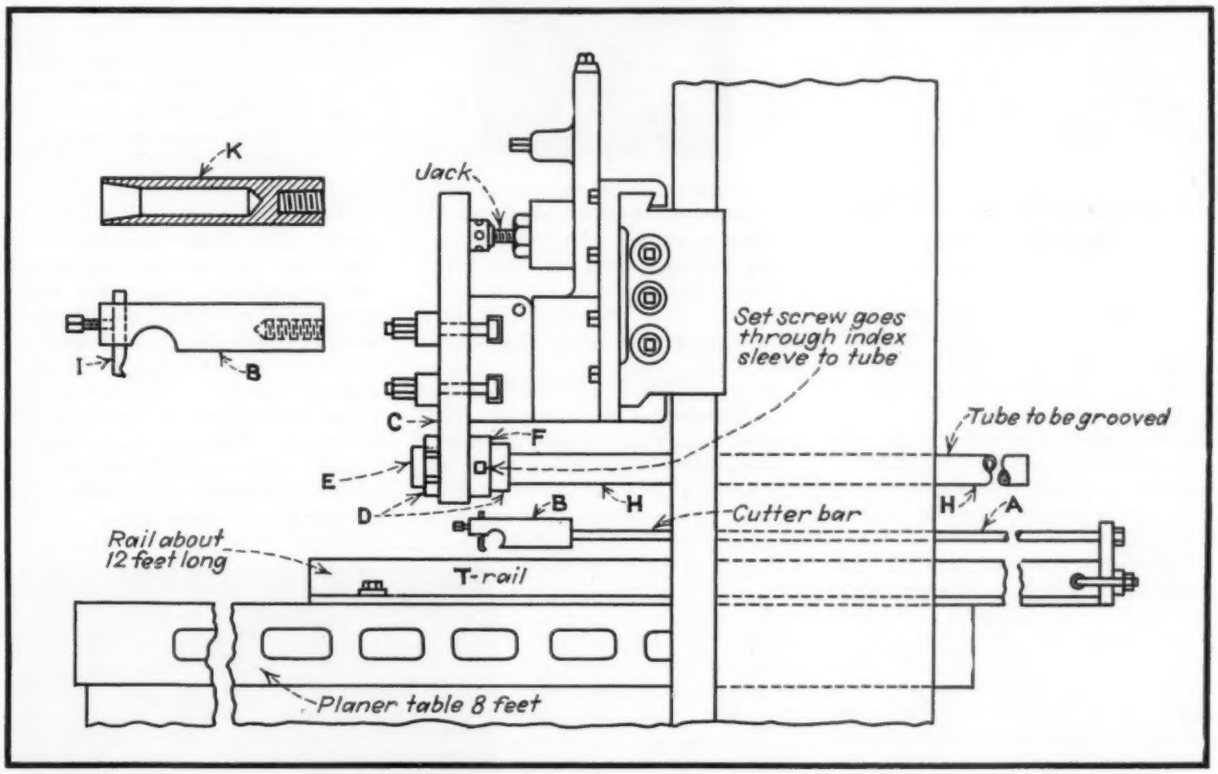
The sliding wedge, actuated by the screw, springs the block upward

Expanding Mandrel

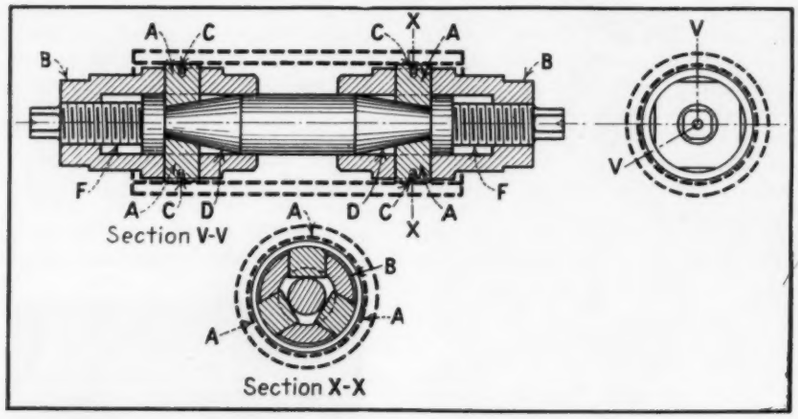
J. R. WHITTLES

Illustrated is an expanding mandrel for holding bushings and pieces of tubing of considerable length and inside diameter.

The work is held by the six hardened gripping pins *A*, three at each end. The pins are carried in holes 120 deg. apart in the sleeves *B* and are held inward by spring rings in the slots *C*. The inner ends of the pins



Cutter head B is pulled through the tube for cutting internal grooves, and considerable time was saved over a previous method



The work is held on the inside by hardened gripping pins which are forced outward to grip it by screwing the sleeves on the body

are machined to suit the tapered parts *D* of the mandrel body and the outer ends are rounded. The outer ends of the sleeves are internally threaded to fit the threads *F* on the body.

When the sleeves are screwed toward the middle of the body, the gripping pins ride up on its tapered parts and are forced outward to grip the work. When they are screwed in the opposite direction, the pins ride down the tapered parts of the body and are held inward by the spring rings, freeing their grip on the work. It is to be understood that the sleeves are turned separately.

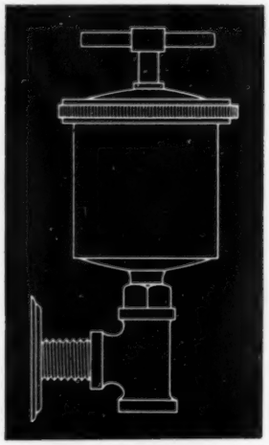
When the sleeves are screwed in either direction, the body is held stationary, flats at the ends of both parts being provided for wrenches.

Compression Grease Cup Dispenses Soap

C. F. FITZ

In many shops there are some men who make their own semi-hard, gritty soap for removing the dirt and grease that gets on their hands while at work. The soap is generally kept in tin cans and is inconvenient to use, to say nothing about its insanitary condition after dirty hands have been scooping it out for weeks and weeks on end.

To dispense the soap conveniently and to keep it in a more sanitary condition, the dispenser illustrated was devised. It consists of a compression grease cup fitted with a tee, a nipple and a flange. The flange is attached by screws to the wall just above the wash bowl. Turning the handle of the grease cup forces the soap out of the bottom of the tee and into the hand held below it. The scheme worked so well that we now have six of the dispensers in use and the men like them very much.



A compression grease cup is used to dispense semi-hard soap. It is fitted as shown and is attached to the wall just above the wash bowl

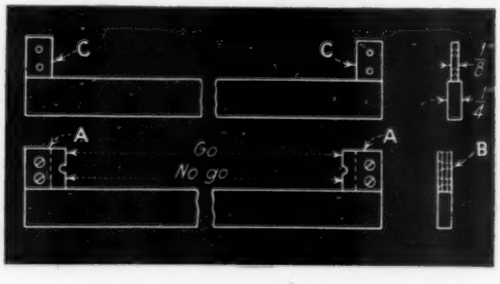
Low-Cost Snap Gages

HECTOR J. CHAMBERLAND

A plant using a considerable number of snap gages ranging from 9 to 20 in. materially reduced their cost by making them as shown below.

The bodies of the gages are made of tool steel and are hardened and ground all over. The contact pieces *A* are made of high-speed steel in sets of six, an allowance of 0.008 in. being made on each contact face for grinding after assembly. The slots *B* in the contact pieces are milled 0.001 in. under size and are lapped after hardening for a snug fit to the tongues *C* where they are held by screws. When the contact pieces have worn enough to destroy the accuracy of the gage, it is but the work of a few minutes to replace them and to grind the replacements to size.

When the contact pieces A are worn they are replaced, the replacements being ground to size after assembly

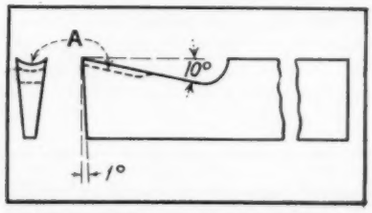


Cutting-Off Tool

P. K. RHINEHART

I found that the cutting-off tool illustrated is out of the ordinary as I have never been able to find anyone who has seen anything like it. So I am passing it along to other readers.

The top of the tool is grooved for a short distance, as at *A*, so as to curl the chip sidewise and make it narrower than the groove cut in the work and prevent it from binding.



The top of the tool is grooved and curls the chip sidewise, making it narrower than the groove cut in the work so that it does not bind

We used this tool for cutting disks $\frac{9}{16}$ in. thick from a bar $4\frac{1}{2}$ in. in diameter. An ordinary cutting-off tool ground in the regular way would not cut off more than ten or fifteen disks without being reground, but this tool cut off 70 disks without regrinding, the work being run at 109 r.p.m. with a feed of 0.0035 in. per revolution. The tool was held in the turret toolblock of a turret lathe, the coolant being a 1 to 12 solution of soluble oil and water.

Radiator grille die-castings are buffed in a rotating fixture before plating

Improved Finishes *for Die Castings*

HERBERT CHASE

SOME FORMS of die castings were once considered hard to finish with assurance of satisfaction in service, but most basic difficulties of this kind have been overcome long since. Today there are not only many greatly improved finishes available, but costs have been lowered in certain instances, thanks to the development of improved technic.

The Harshaw System

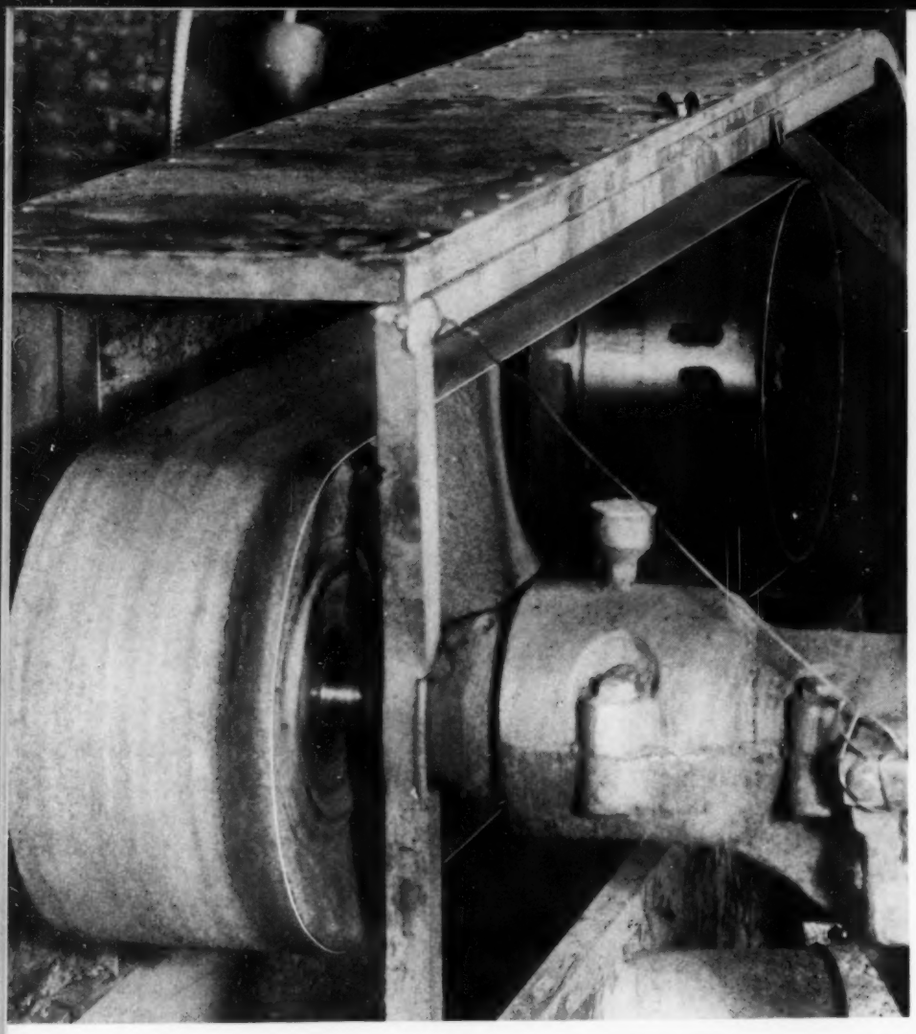
Since die castings of zinc alloys are used in quantities some three times as great as other types combined, there is naturally greatest interest in finishes for this type. Perhaps the outstanding development in this category is that of a commercially feasible bright nickel finish. Bright nickel in itself is not new, but the application of it on a large and increasing scale has been delayed by the difficulties of maintaining uniformity in the results secured. These difficulties have been reduced by close chemical control to the point where bright plating on a large volume basis is warranted. At least two important die-casting plants are using the Harshaw bright nickel system with good results and with marked reduction in polishing and buffing operations. The latter economy is a primary reason for using bright nickel.

Details, especially of the latest Harshaw bright nickel-plating system, are not yet available for publication. It may be said, however, that the plating is being done with a normal Watts type of solution to which is added a brightener, a pit-preventing agent and an organic carrier. Originally, these were added together, but it has been found better to add them separately and in such a way as to maintain their respective proportions substantially constant. This is one reason for the exacting chemical control required. In one plant, the solution is held at 125 F. and parts are plated for 20 min. at 35 amp. per sq.ft. current density to yield a nickel coating of 0.0005 in. minimum thickness. Plating is done over an initial coat of copper having a minimum thickness of 0.0003 in. The copper solution used gives a fairly bright finish which helps the brightness of the subsequent nickel coat. Since the chromium, used as the final coat for exterior hardware, is also bright, the entire plating process can be done without buffing between coats.

Automobile hardware for exterior exposure is generally required to meet rather exacting specifications. Usually a total thickness of 0.0008 in. minimum is demanded at least on cars outside the lower price brackets. For interior and for many non-automotive applications, the copper coat is often omitted and a coating of 0.0003 in. minimum of nickel (followed by a flash of chromium, when substantial freedom from tarnishing is required) is considered satisfactory. It is now generally recognized that the life of plated finishes on die castings for a given set of conditions is closely proportional to the thickness of plate used. When an under-coat of copper is required or specified, it should not be less than 0.0003 in. thick. Otherwise difficulty may be encountered with the following coat of nickel.

Copper Flash Preferred

Some authorities on plating still contend that copper is not needed, and perhaps better omitted, even for outdoor exposure, if 0.0008 in. minimum of nickel is applied direct to the zinc. Even so the preference of



A sanding belt run over a buffing wheel is used for polishing die castings; the cast-iron pulley has automatic belt tightening arrangement

some automobile manufacturers, and the specified requirement of others is for an initial coat of copper of 0.0003 in. minimum and a total of copper and nickel of 0.0008 to 0.001 in. minimum.

Economical Set-ups

Most die castings are buffed and many of them require some polishing (sometimes termed grinding) prior to plating. One plant has experimented successfully with a method of polishing which is novel in that one end of a long sanding or emery-cloth belt is run over a buffing wheel instead of over a solid pulley. The work is held against the belt where it runs over the buff. As the latter is soft, the belt can yield and accommodate itself in some degree to an irregular surface, whereas this would not be true on an ordinary polishing wheel. In addition, as the belt is quite long and has a total surface much larger in area than that of the ordinary grinding wheel periphery, it will grind more die castings without renewal than will the usual polishing set-up, providing care is used not to cut the belt by exerting excess pressure with the sharp edge of a casting.

Another way in which polishing and buffing costs are sometimes decreased where the number of parts to be polished is large, is to use a special fixture often a rotating one, in which the work is mounted when brought into contact with the buff or polishing wheel. Such set-ups may or may not be rather expensive, but can often be made to effect economies when intelligently designed and applied.

Some die-cast hardware now is being turned out with a bright plated finish and without buffing before plating, between coats of plating or following plating. The finish secured in this manner is not regarded as the best possible, that is, not equal to that in which some buffing and coloring is done, but it is acceptable for use in some cars.

Alkali and Acid

The importance of proper cleaning of die castings prior to plating is now generally recognized. Degreasing with trichlorethylene is quite generally favored and it should be followed, according to some authorities, by cathodic cleaning in a hot mild alkaline solution having a pH not to exceed 10. The time in this bath probably should not exceed 10 to 15 sec. (some say 5 sec. max.) and should be followed by thorough rinsing and a short dip in a weak mineral acid solution, such as one containing five percent of sulphuric and the same quantity of hydrochloric acid. This neutralizes any alkali remaining.*

Many die castings are employed, of course, without any applied finish, especially when not exposed to view, and they are seldom subject to any but a slight surface corrosion or tarnishing. When zinc-alloy castings are subject to prolonged contact with water or condensed moisture a somewhat bulky white oxide may form. Such corrosion can be minimized by dipping in a patented "Cronak" solution (New Jersey Zinc Company) which, within 10 to 15 sec., forms a protective film of green to yellowish hue. This is not an ornamental finish but is highly effective for the purpose indicated.

Tough Organic Finishes

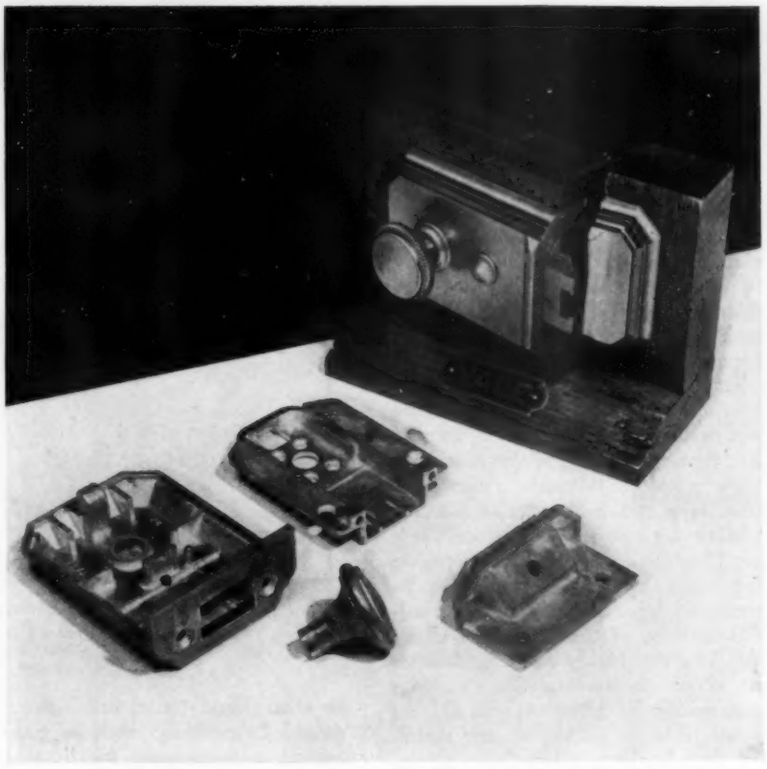
Besides the foregoing and other excellent plated finishes, there are many acceptable and highly enduring, as well as ornamental organic finishes available for zinc die castings and they are extensively used. These are usually classed as enamels, some of which are designed for baking. Others are nitrocellulose lacquer-enamels for air drying and at least one (the Macoid finish) is a pyroxylin dipping type, yielding a nitrocellulose coat some 0.005 in. in thickness. Although each maker of organic finishes for such applications has his own formulas which he does not reveal, many of the modern finishes in question contain one or more alkyd or other synthetic resins which are largely responsible for their enduring properties, including adhesion, resistance to abrasion, extensibility as well as ability, in some cases, to resist weathering in outdoor exposure. Enduring properties are often increased by baking at moderate temperatures (about 325 F. is the maximum for A.S.T.M. No. 23 alloy), but good air drying finishes are also available.

Since the zinc alloys are capable of

* For details as to platings solutions, both copper and conventional nickel, and a complete schedule of polishing, buffing and cleaning operations which may precede plating, see appendix to annual report of Committee B-6, ASTM prepared by J. C. Fox (1936) although this contains only passing reference to bright nickel plating. See also author's book, "Die Castings."

taking a high polish, it is not essential to plate them to take advantage of such polish. An alternative, suitable for certain classes of service, is to apply one or more coats of clear synthetic varnish over the freshly buffed (and cleaned) surface. This is required to prevent tarnishing which is likely to develop rapidly without such protection. Varnishes which do not yellow noticeably in service are available.

In applications where the cost of buffing is not warranted, it is possible to produce an acceptable luster on zinc die castings by tumble burnishing, although the technic employed has yet to gain extensive commercial use and is restricted to small parts. It is possible to use it for some castings having recesses which could not be reached with ordinary buffing wheels. "Cutting down" by tumbling with suitable abrasives precedes tumble burnishing or it can be used to smooth surfaces before wheel buffing or enameling.



Plated bronze finish has been applied directly to zinc-alloy lock case, strike and knob prior to oxidizing in acid solution

Acid Dip Desirable

Cleaning of die castings prior to the application of organic finishes is just as important as it is prior to plating. The same cleaning methods may be used or any one of several proprietary treatments may be employed or a light sand-blasting is effective. Solvent or degreasing treatments are effective in removing oil and grease but should be applied in such a way that no trace of oily substance remains. Treatment with mild alkali solutions is also effective, especially when the castings are made the cathode in electrolytic cleaning, but thorough removal of the alkali is important. A slight roughening or etching of the surface to promote adhesion of the finish is highly desirable and may be accomplished by an acid dip similar to that prior to plating. This has the advantage of neutralizing any alkali that may remain, but must be followed by thorough rinsing and drying. Finishing should follow cleaning as soon as possible. Various other chemical treatments, such as Bonderite Z (Parker Rustproof Company), and Zinsol (Maas & Waldstein Company) are also reported effective and may also tend to inhibit oxidation and prevent possible chemical reaction between the finish and the metal.

Although the application of a good primer, such as one containing chromate and iron oxide or aluminum flake in a synthetic resin vehicle, preferably baked on, is advocated by some authorities, it is by no means essential in most types of exposure. Good enamels, designed for the purpose, are available in forms such as to give an acceptable finish for some purposes in a single coat. However, more than one coat, the first being a good primer in some instances, is quite sure to afford better protection as well as better appearance.

A recent development in novelty finishes is the application of woodgrain, marbleized and similar films, 0.003 in. in thickness, in much the same manner that decalcomania are applied. This type of finish, available through the Advanced Products Association, is applied over an enamel finish in the usual way. The film is

Interior hardware may be finished by dipping in a nitro-cellulose solution ("Macoid" finish)

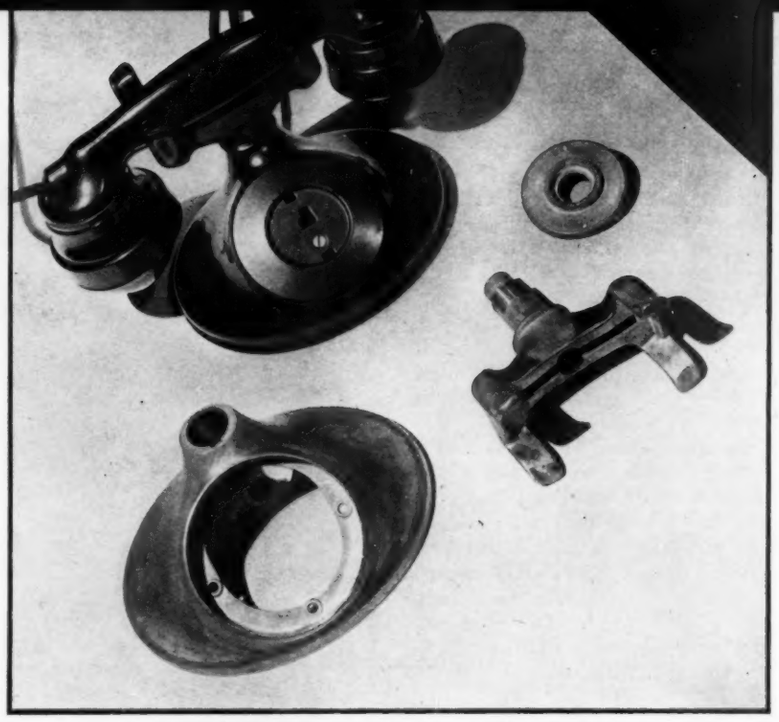
cemented to the enamel coat much like a decalcomania, having been prepared in the same way by a photolithographic process. After this application, the whole surface, including the decorative film, is covered with a coat of lustrous and enduring clear lacquer, which brings out the design or grain and affords it protection.

Turning now to the finishing of aluminum-alloy die castings, it may be said that, although they are considered rather difficult to plate in such a way as to assure good adherence of the plating, there is somewhat less need for plating than with zinc alloys because tarnishing occurs less rapidly and discoloration may be less. Some aluminum alloys, especially those with considerable nickel content, take and hold a polish without plating for considerable periods. A good luster and one that is acceptable for many applications can also be produced by ball burnishing. In addition, some of the aluminum alloys can be given highly enduring finishes by anodic treatment. Such castings can readily be given organic finishes equal to those on almost any metal. As the aluminum alloys have a relatively high melting point, finishes can be baked at high temperature and even a vitreous enamel can be applied.

Baked Aluminum

An essential to successful plating on aluminum is the use of a prior etching such as to give a "tooth" or actual undercut of microscopic dimensions to anchor the plate securely. Details as to plating are given in the references already cited and need not be repeated here. The same may be said as to preparation for organic finishing. Such finishing is much the same as for the zinc alloys and many of the same finishes are suitable for either aluminum or zinc. Some forms which are improved by high baking and are well suited for aluminum may either not be suited for zinc or not quite so enduring because of the lower baking temperatures necessary with zinc alloys. Anodic coatings for aluminum have no counterpart (of suitable endurance) in zinc. Such coatings on aluminum are hard and resistant to abrasion, yet are so porous as to permit of dyeing in bright colors of high luster and striking appearance not readily duplicated by other means.

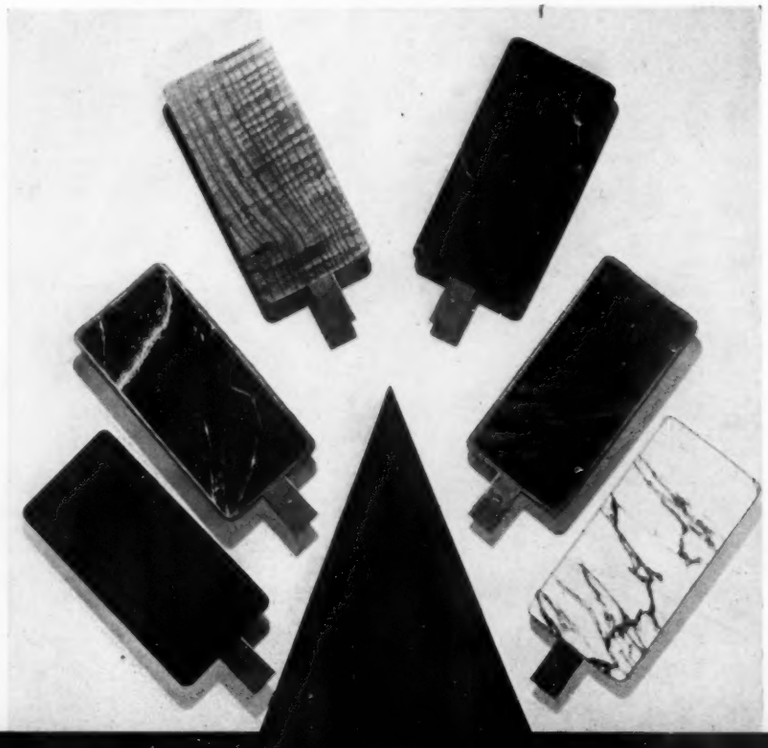
Of the remaining alloys used in die casting, the lead and tin-base types are little used and seldom require a finish when employed. The brass alloys used for die casting, though often plated in much the same way as other brass parts, are highly resistant to corrosion and, in general, require a finish only for decorative purposes and this is usually nickel or chromium plate.



Black enamel baked on zinc castings make up the telephone of today

Although die castings of magnesium base are still somewhat of a rarity recent improvements in the casting process have brought them into wider commercial use, and this use is likely to be extended where parts of lighter weight than aluminum are required. Application of an organic finish is usually recommended both for protection against corrosion and for appearance. Prior to finishing, it is recommended that magnesium castings be dipped for ½ to 2 min. into a solution containing one pound of chromic acid and 0.9 pints of nitric acid to the gallon of water. This is done at room temperature, after which the castings should be rinsed in water and dried before finishing. Makers of magnesium alloys recommend that finishing include, as a rule, a priming and one or more finishing coats, and that the character of material and method of finishing be worked out in close cooperation with a paint manufacturer familiar with the problems involved.

Novel grained finishes on sample die castings are protected by a finish coat of clear lacquer



Cutting Speeds for Cold-Finished S.A.E. Steels

Data on the approximate machine ratings and turning speeds for cold-finished S.A.E. steels are reproduced on this page and the following page through the courtesy of Bliss & Laughlin, Inc.

MACHINE CHART SHOWING APPROXIMATE CUTTING SPEED FOR TURNING COLD FINISHED STEELS IN SURFACE FEET PER MINUTE

STEEL	CHEMICAL COMPOSITION									Approx. Machine Rating in %	Approx. Turning Speed in S.F.M.	Is it Suitable for Carburizing	Is it Suitable for Heat Treating
	Carbon	Manganese	Phos.	Sulphur	Silicon	Nickel	Cr.	Va.	Mo.				
Ultra-Cut	.....	.....	.....	.....	Bessemer		.....	.....	.....	130–140	‡210–300	Yes	No
SAE X-1112	.08/.16	.60/.90	.09/.13	.20/.30	Screw	Stock	.....	.....	.....	120–130	‡200–260	Yes	No
SAE 1112	.08/.16	.60/.90	.09/.13	.10/.20			.....	.....	.....	100%	160	Yes	No
SAE X-1314	.10/.20	1.00/1.30	.045	.075/.15			.....	.....	.....	94–97	140+	Yes	Not advisable
SAE X-1315	.10/.20	1.30/1.60	.045	.075/.15			.....	.....	.....	94–97	130+	Yes	Not advisable
SAE 1115	.10/.20	.70/1.00	.045	.075/.15	Open H	earth	.....	.....	.....	85–90	130+	Yes	No
SAE 1120	.15/.25	.60/.90	.045	.075/.15	Screw	Stock	.....	.....	.....	80	125+	Yes	No
SAE X-1330	.25/.35	1.35/1.65	.045	.075/.15			.....	.....	.....	78	125	No	Yes
SAE X-1335	.30/.40	1.35/1.65	.045	.075/.15			.....	.....	.....	75	125	No	Yes
SAE X-1340	.35/.45	1.35/1.65	.045	.075/.15			.....	.....	.....	72	120+	No	Yes
SoftBessemer	.12	.30/.60	.09/.13	.04/.07	.....	.....	.....	.....	.....	75	120+	Yes	No
SAE X-1015	.10/.20	.70/1.00	.045	.055			.....	.....	.....	65	115+	Yes	No
SAE X-1020	.15/.25	.70/1.00	.045	.055			.....	.....	.....	70	120	Yes	No
SAE X-1025	.20/.30	.70/1.00	.045	.055			.....	.....	.....	70	120	No	Yes
SAE 1010	.05/.15	.30/.60	.045	.055			.....	.....	.....	45	95	Yes	No
SAE 1015	.10/.20	.30/.60	.045	.055			.....	.....	.....	50	100	Yes	No
SAE 1020	.15/.25	.30/.60	.045	.055			.....	.....	.....	60	115	Yes	No
SAE 1025	.20/.30	.30/.60	.045	.055			.....	.....	.....	65	120	Yes	Not advisable
SAE 1030	.25/.35	.60/.90	.045	.055			.....	.....	.....	70	125	No	Yes
SAE 1035	.30/.40	.60/.90	.045	.055			.....	.....	.....	62	120+	No	Yes
SAE 1040	.35/.45	.60/.90	.045	.055			.....	.....	.....	*61	115	No	Yes
SAE X-1040	.35/.45	.40/.70	.045	.055			.....	.....	.....	*62	115+	No	Yes
SAE 1045	.40/.50	.60/.90	.045	.055			.....	.....	.....	*55	90	No	Yes
SAE X-1045	.40/.50	.40/.70	.045	.055	Plain C	arbon	.....	.....	.....	*57	95	No	Yes
SAE 1050	.45/.55	.60/.90	.045	.055	Open H	earth	.....	.....	.....	*50	85	No	Yes
SAE X-1050	.45/.55	.40/.70	.045	.055	Steels		.....	.....	.....	*53	85+	No	Yes
SAE 1055	.50/.60	.60/.90	.040	.055			.....	.....	.....	†45	85	No	Yes
SAE X-1055	.50/.60	.90/1.20	.040	.055			.....	.....	.....	†42	80	No	Yes
SAE 1060	.55/.70	.60/.90	.040	.055			.....	.....	.....	†41	85	No	Yes
SAE 1065	.60/.75	.60/.90	.040	.055			.....	.....	.....	†40	85	No	Yes
SAE X-1065	.60/.75	.90/1.20	.040	.055			.....	.....	.....	†35	80	No	Yes
SAE 1070	.65/.80	.60/.90	.040	.055			.....	.....	.....	†38	80	No	Yes
SAE 1075	.70/.85	.60/.90	.040	.055			.....	.....	.....	†37	80	No	Yes
SAE 1080	.75/.90	.60/.90	.040	.055			.....	.....	.....	†36	80	No	Yes
SAE 1085	.80/.95	.60/.90	.040	.055			.....	.....	.....	†35	75	No	Yes
SAE 1090	.85/1.00	.60/.90	.040	.055			.....	.....	.....	†34	75	No	Yes
SAE 1095	.90/1.05	.25/.50	.040	.055			.....	.....	.....	†35	75	No	Yes
SAE T1330	.25/.35	1.60/1.90	.040	.050	.15/.30	High	.....	.....	.....	*52	85	No	Yes
SAE T1335	.30/.40	1.60/1.90	.040	.050	.15/.30	Manganese	.....	.....	.....	*50	80	No	Yes
SAE T1340	.35/.45	1.60/1.90	.040	.050	.15/.30	Low Sulphur	.....	.....	.....	*47	80	No	Yes
SAE T1345	.40/.50	1.60/1.90	.040	.050	.15/.30	Open Hearth	.....	.....	.....	†45	80	No	Yes
SAE T1350	.45/.55	1.60/1.90	.040	.050	.15/.30	Grades	.....	.....	.....	†40	75	No	Yes
SAE 2015	.10/.20	.30/.60	.040	.050	.15/.30	.40/.60		.....	.....	60	120	Yes	No
SAE 2115	.10/.20	.30/.60	.040	.050	.15/.30	1.25/1.75		.....	.....	60	120	Yes	No
SAE 2315	.10/.20	.30/.60	.040	.050	.15/.30	3.25/3.75		.....	.....	50–60	115	Yes	No
SAE 2320	.15/.25	.30/.60	.040	.050	.15/.30	3.25/3.75	Nickel	.....	.....	50	115	Yes	No
SAE 2330	.25/.35	.50/.80	.040	.050	.15/.30	3.25/3.75	Alloy	.....	.....	*50	110	No	Yes
SAE 2335	.30/.40	.50/.80	.040	.050	.15/.30	3.25/3.75	Steels	.....	.....	*50	100	No	Yes
SAE 2340	.35/.45	.60/.90	.040	.050	.15/.30	3.25/3.75		.....	.....	†45	90	No	Yes
SAE 2345	.40/.50	.60/.90	.040	.050	.15/.30	3.25/3.75		.....	.....	†45	80	No	Yes
SAE 2350	.45/.55	.60/.90	.040	.050	.15/.30	3.25/3.75		.....	.....	†40	70	No	Yes
SAE 2515	.10/.20	.30/.60	.040	.050	.15/.30	4.75/5.25		.....	.....	45–50	95	Yes	No

*Note. If these steels are specified annealed their machine ratings may be advanced 10% to 25%.
†Note. These steels should be annealed prior to cold drawing, and if so specified, advance machine rating 15% to 25%.
‡Governed by conditions in various shops and equipment.
The column "Approximate Machine Rating in Per Cent" gives the number of pieces that can be produced from various S.A.E. steels, based on S.A.E. 1112 as 100 per cent.

Cutting Speeds for Cold-Finished S.A.E. Steels

MACHINE CHART SHOWING APPROXIMATE CUTTING SPEED FOR TURNING COLD FINISHED STEELS IN SURFACE FEET PER MINUTE

STEEL	CHEMICAL COMPOSITION									Approx. Machine Rating in %	Approx. Turning Speed in S.F.M.	Is it Suitable for Carburizing	Is it Suitable for Heat Treating
	Carbon	Manganese	Phos.	Sulphur	Silicon	Nickel	Cr.	Va.	Mo.				
SAE 3115	.10/.20	.30/.60	.040	.050	.15/.30	1.00/1.50	.45/.75			55	100	Yes	Not advisable
SAE 3120	.15/.25	.30/.60	.040	.050	.15/.30	1.00/1.50	.45/.75			45–50	100	Yes	Not advisable
SAE 3125	.20/.30	.50/.80	.040	.050	.15/.30	1.00/1.50	.45/.75	Low		*45–50	90	Not advisable	Yes
SAE 3130	.25/.35	.50/.80	.040	.050	.15/.30	1.00/1.50	.45/.75	Chrome		*45–50	90	No	Yes
SAE 3135	.30/.40	.50/.80	.040	.050	.15/.30	1.00/1.50	.45/.75	Nickel		*45–50	85	No	Yes
SAE 3140	.35/.45	.60/.90	.040	.050	.15/.30	1.00/1.50	.45/.75	Series		*45–50	80	No	Yes
SAE X-3140	.35/.45	.60/.90	.040	.050	.15/.30	1.00/1.50	.60/.90			*40–50	80	No	Yes
SAE 3145	.40/.50	.60/.90	.040	.050	.15/.30	1.00/1.50	.45/.75			*40–45	80	No	Yes
SAE 3150	.45/.55	.60/.90	.040	.050	.15/.30	1.00/1.50	.45/.75			*35–40	70	No	Yes
SAE 3215	.10/.20	.30/.60	.040	.050	.15/.30	1.50/2.00	.90/1.25	.....	.....	50–55	95	Yes	Not advisable
SAE 3220	.15/.25	.30/.60	.040	.050	.15/.30	1.50/2.00	.90/1.25	.....	.....	50	90	Yes	Not advisable
SAE 3230	.25/.35	.30/.60	.040	.050	.15/.30	1.50/2.00	.90/1.25	.....	.....	*45	85	No	Yes
SAE 3240	.35/.45	.30/.60	.040	.050	.15/.30	1.50/2.00	.90/1.25	.....	.....	*40	75	No	Yes
SAE 3245	.40/.50	.30/.60	.040	.050	.15/.30	1.50/2.00	.90/1.25	.....	.....	†37	70	No	Yes
SAE 3250	.45/.55	.30/.60	.040	.050	.15/.30	1.50/2.00	.90/1.25	.....	.....	†35	70	No	Yes
SAE 3312	0.17Max	.30/.60	.040	.050	.15/.30	3.25/3.75	1.25/1.75	.....	.....	50	90	Yes	No
SAE 3325	.20/.30	.30/.60	.040	.050	.15/.30	3.25/3.75	1.25/1.75	.....	.....	40	75	Not advisable	Yes
SAE 3335	.30/.40	.30/.60	.040	.050	.15/.30	3.25/3.75	1.25/1.75	.....	.....	*35	70	No	Yes
SAE 3340	.35/.45	.30/.60	.040	.050	.15/.30	3.25/3.75	1.25/1.75	.....	.....	*35	70	No	Yes
SAE 3415	.10/.20	.30/.60	.040	.050	.15/.30	2.75/3.25	.60/.95	.....	.....	50	95	Yes	Not advisable
SAE 3435	.30/.40	.30/.60	.040	.050	.15/.30	2.75/3.25	.60/.95	.....	.....	*35	70	No	Yes
SAE 3450	.45/.55	.30/.60	.040	.050	.15/.30	2.75/3.25	.60/.95	.....	.....	†35	70	No	Yes
SAE 4130	.25/.35	.50/.80	.040	.050	.15/.30	.....	.50/.80	.....	.15/.25	*55	110	No	Yes
SAE X-4130	.25/.35	.40/.60	.040	.050	.15/.30	.....	.80/1.10	.....	.15/.25	*55	110	No	Yes
SAE 4135	.30/.40	.60/.90	.040	.050	.15/.30	.....	.80/1.10	.....	.15/.25	*52	105	No	Yes
SAE 4140	.35/.45	.60/.90	.040	.050	.15/.30	.....	.80/1.10	.....	.15/.25	*50	100	No	Yes
SAE 4150	.45/.55	.60/.90	.040	.050	.15/.30	.....	.80/1.10	.....	.15/.25	†45	80	No	Yes
SAE 4340	.35/.45	.50/.80	.040	.050	.15/.30	1.50/2.00	.50/.80	.....	.30/.40	*50	95+	No	Yes
SAE 4345	.40/.50	.50/.80	.040	.050	.15/.30	1.50/2.00	.60/.90	.....	15/.25	†45	90+	No	Yes
SAE 4615	.10/.20	.40/.70	.040	.050	.15/.30	1.65/2.00	.....	.....	.20/.30	60	120	Yes	Not advisable
SAE 4620	.15/.25	.40/.70	.040	.050	.15/.30	1.65/2.00	.....	.....	.20/.30	62	125	Yes	Not advisable
SAE 4640	.35/.45	.50/.80	.040	.050	.15/.30	1.65/2.00	.....	.....	.20/.30	*50	95	No	Yes
SAE 4815	.10/.20	.40/.60	.040	.050	.15/.30	3.25/3.75	.....	.....	.20/.30	50–60	115	Yes	Not advisable
SAE 4820	.15/.25	.40/.60	.040	.050	.15/.30	3.25/3.75	.....	.....	.20/.30	50–60	115+	Yes	Not advisable
SAE 5120	.15/.25	.30/.60	.040	.050	.15/.30	.....	.60/.90	.....	.....	55	100	Yes	Not advisable
SAE 5140	.35/.45	.60/.90	.040	.050	.15/.30	.....	.80/1.10	.....	.....	*45	85	No	Yes
SAE 5150	.45/.55	.60/.90	.040	.050	.15/.30	.....	.80/1.10	.....	.....	†37	75	No	Yes
SAE 52100	.95/1.10	.20/.50	.030	.035	.15/.30	.....	1.20/1.50	.....	.....	†30	60	No	Yes
SAE 6115	.10/.20	.30/.60	.040	.050	.15/.30	.....	.80/1.10	Min..15	.....	60	110	Yes	Not advisable
SAE 6120	.15/.25	.30/.60	.040	.050	.15/.30	.....	.80/1.10	Min..15	.....	55	100	Yes	Not advisable
SAE 6125	.20/.30	.60/.90	.040	.050	.15/.30	.....	.80/1.10	Min..15	.....	*50	95	Not advisable	Yes
SAE 6130	.25/.35	.60/.90	.040	.050	.15/.30	.....	.80/1.10	Min..15	.....	*48	90	No	Yes
SAE 6135	.30/.40	.60/.90	.040	.050	.15/.30	.....	.80/1.10	Min..15	.....	*45	85	No	Yes
SAE 6140	.35/.45	.60/.90	.040	.050	.15/.30	.....	.80/1.10	Min..15	.....	*45	80	No	Yes
SAE 6145	.40/.50	.60/.90	.040	.050	.15/.30	.....	.80/1.10	Min..15	.....	*40–45	80	No	Yes
SAE 6150	.45/.55	.60/.90	.040	.050	.15/.30	.....	.80/1.10	Min..15	.....	†35	70	No	Yes
SAE 6195	.90/1.05	.20/.45	.030	.035	.80/1.10	.....	.80/1.10	Min..15	.....	†30	60	No	Yes
SAE 9255	.50/.60	.60/.90	.040	.050	1.80/2.20	Spring	.....	.....	.....	†35	70	No	Yes
SAE 9260	.55/.65	.60/.90	.040	.050	1.80/2.20	Steels	.....	.....	.....	†30	60	No	Yes

*Note. If these steels are specified annealed their machine ratings may be advanced 10% to 25%.
†Note. These steels should be annealed prior to cold drawing, and if so specified, advance machine rating 15% to 25%.

The column "Approximate Machine Rating in Per Cent" gives the number of pieces that can be produced from various S.A.E. steels, based on S.A.E. 1112 as 100 per cent.

Tapping Fixtures *for Small Parts*

XV — Usually much simpler than drill jigs, tapping fixtures for small parts can be made highly productive through careful forethought

C. W. HINMAN
Tool Engineer
Kobzy Tool & Electric Manufacturing Company

THE PRINCIPAL features in the design of tapping fixtures are: gages for approximately locating the work, and clamps or a stripper plate over the work to hold the piece *down* while backing out the tap. In Fig. 112 is shown a fixture for tapping several holes in sheet metal, the holes having been previously pierced in a die. Plate *A* is the stripper, and the work is approximately located against pins *B*. Clearance holes are provided through *A* and fixture body *C*, to clear the taps. Clamping space is allowed for securing the tool on the machine table, and a "finger hold" recess is cut, as shown, for inserting and removing the work.

Multiple-spindle tapping heads are often used for threading scattered holes in single pieces. Fig. 113 shows a magazine T-slot fixture for tapping nuts and similar pieces. The tapping machine is provided with a treadle control. The positive tendency of the treadle feed is offset by a spring coupling in the treadle pull-rod. Six to ten pieces are tapped in one strike, and the operator's hands are free to load the right-hand portion of the jig while tapping at the left. Finger stop *A* is withdrawn, and the finished pieces are pushed out by sliding forward the next multiple of blanks. When drilling or piercing the blanks, the tap hole is slightly countersunk with a 90 deg. included angle, which eliminates the usual burring operation after tapping. The jig is attached to the machine table with clamps or screws.

The design for a high-speed tapping fixture for small clips, angles, terminals or connectors, one piece per strike, is shown in Fig. 114. Open and crossed belts, for tapping in and out, drive a friction tapping head substituted for the headstock on a speed lathe. The tapered shank on the fixture is inserted in the tailstock, and is moved forward and backward by means of a toggle lever. The blank, shown at *A*, is inserted in the T-slot from underneath the jig with the left hand and pushed up against a stop. The piece is held with the left hand, while the right hand, on the lever, feeds the fixture and work to the tap-

Fig. 112—The work is slipped under the stripper and pushed up against locating pins *B* before tapping the several pierced holes

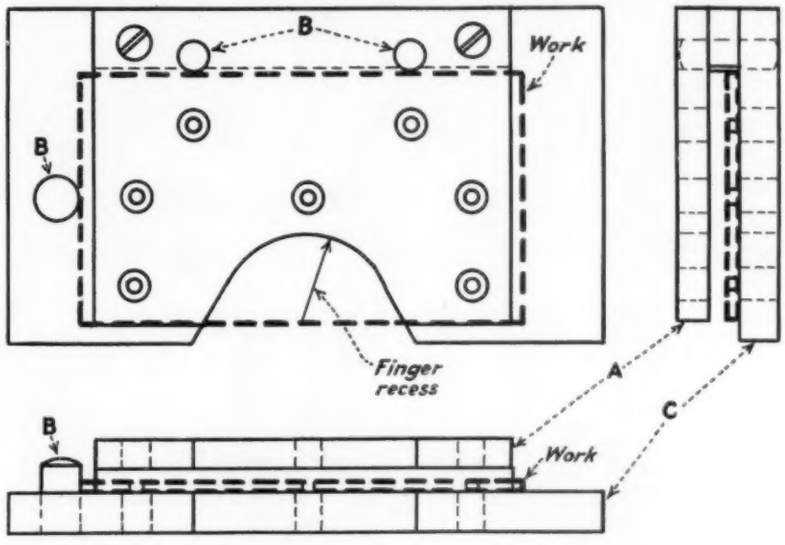
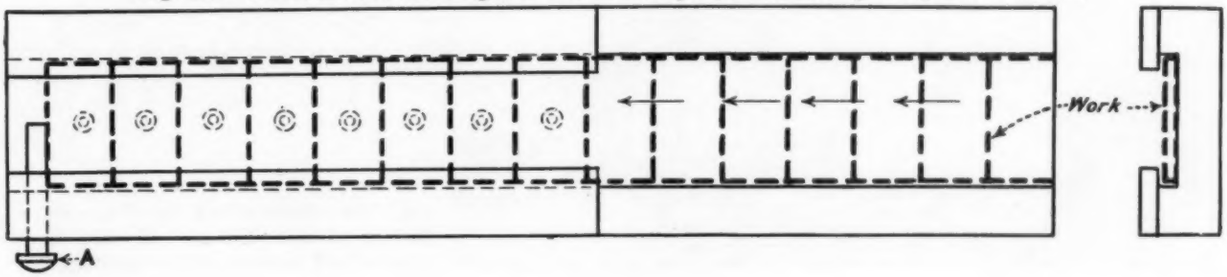


Fig. 113—Pieces are fed from right to left in multiples, when the finger stop *A* is withdrawn



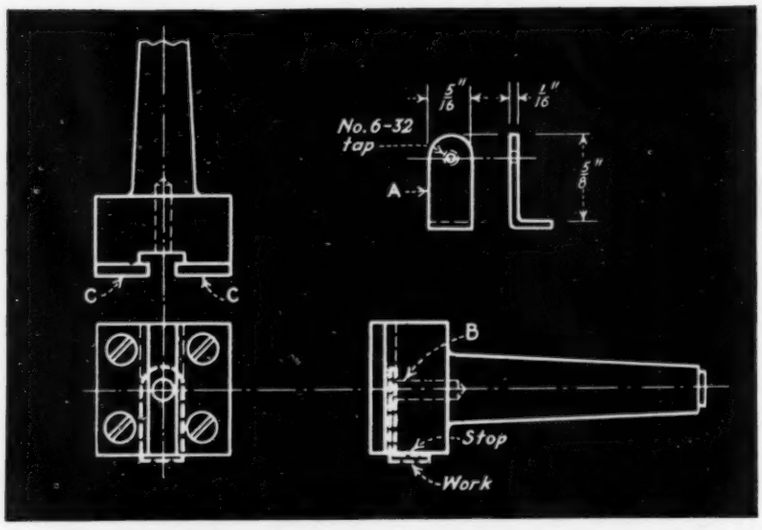


Fig. 114—High-production tapping of small parts can be done with this fixture held in the tailstock of a speed lathe

ping head. Hole *B* clears the tap in the fixture, and plates *C* strip the work when the tool recedes. After tapping, the piece drops out of the tool by gravity into a pan beneath, and the operation is repeated. The stroke is only about 3 in. and the operator always has another blank ready to insert immediately after the fixture is clear. There are cases in which this set-up has handled over 3,000 pieces per hour.

When tapping two or three holes in large quantities of small parts, and using a single tap, speed is increased by designing the most suitable fixtures. The semi-universal tapping fixture seen in Fig. 115 is one type of many used for this purpose. The principle is simply a swinging lever arm *A*, mounted at one end on screw *B* in fixture body *C*. At the outer end of the arm is an opening *D* for holding the work *E*. The arm swings against a stop pin in two positions, and the hole to be tapped is aligned

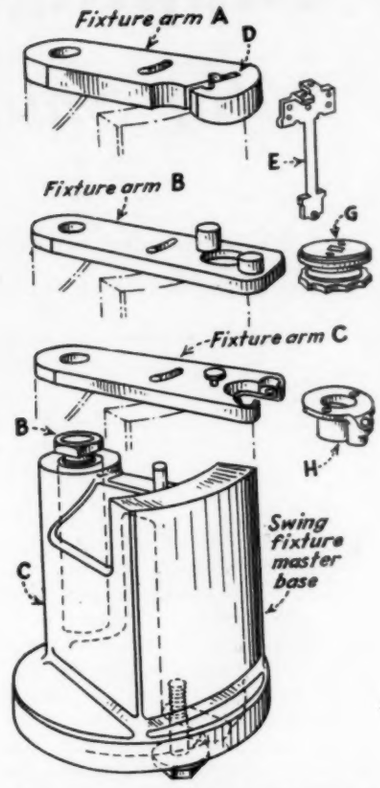
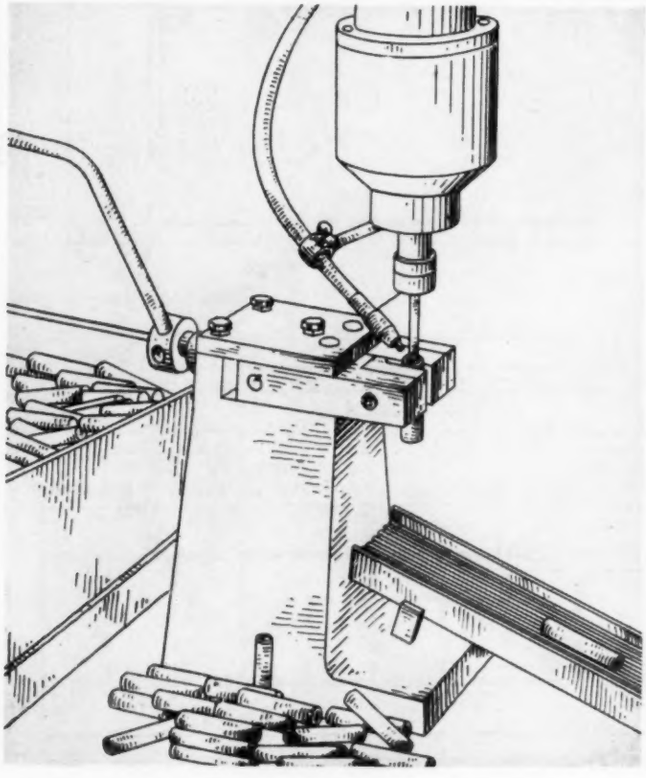


Fig. 115—Swinging arm *A* is changed for differently shaped pieces, but the fixture body *C* is retained

PIECE E
Two holes—900 pieces per hr.
Material—Permalloy
Tap used—two-flute gun type
Tap speeds—1,750 in; 3,500 out

PIECE G
Two holes—1,000 pieces per hr.
Material—molded bakelite
Tap used—three-flute nitrided
Tap speeds—1,500 in; 3,000 out

PIECE H
Two holes—1,050 pieces per hr.
Material—brass forging
Tap used—three-flue gun
Tap speeds—3,000 in; 6,000 out



in each position with the tap. For differently shaped pieces, a new arm is designed to suit conditions. This method reduces tool expense, because the same fixture body *C* is available for all the arms.

The universal tapping and drilling vise in Fig. 116, centralizes the work between its jaws by means of an equalizing screw operated by a 30 deg. movement of the crank arm. Special sub-jaws are made and attached in the vise for holding round, square,

Fig. 116—Special sub jaws are attached to this drilling and tapping vise to hold sections of various shapes

hexagonal, and other sections. This high-speed fixture is shown equipped for tapping round brass tubing up to 1 in. diameter. The overhanging jaws makes it possible to drop the finished parts by gravity when opening the vise. Using gravity as a factor in tool and machine design usually results in speedy production, and should always be considered.

Vertical-Post Fixtures

A design for a vertical-post tapping fixture with a stripper plate across its top is shown in Fig. 117. It is used for threading two No. 6-32 holes in a brass stamping $\frac{1}{16}$ in. thick. The rate is 1,500 pieces per hour, and the blanks are fed continuously from one side.

Another type of vertical-post tapping fixture is shown in Fig. 118. The blanks are cut from extruded brass rod and drilled in a jig. For tapping, the blanks are placed alternately from either side as shown. The tap size is ¼-20, and the production rate is 2,400 pieces per hour. Figs. 115, 116, 117 and 118, with the given production rates, are used by permission of the R. G. Haskins Company.

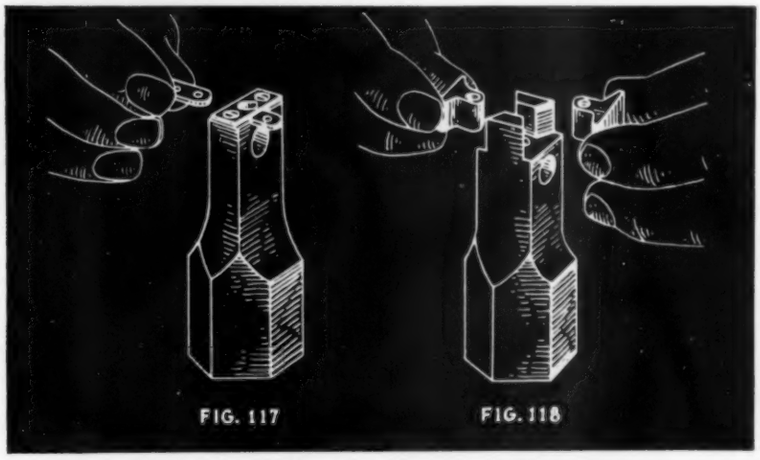
Tapping large quantities of nuts is done in several ways besides using a commercial nut-tapping machine. For tapping small quantities, nuts may be placed face down within the confines of a channel fixture. The channel sides act like a wrench to prevent the tap from revolving the nut. The tap has a long special shank, with a diameter 0.005 in. less than the root diameter. The fixture is clamped on a drilling machine table, and the tap is secured in a common non-reversible drilling chuck. After tapping a nut, each one is pushed up higher on the tap shank, until twelve to twenty nuts in height reach the chuck jaws. The tap is then removed, turned down over a stock pan, and the nuts slide off. This is an easy and profitable method for the small shop.

Production Nut Tapping

The "bent-tap method" for tapping square or hexagonal nuts was developed about 30 years ago by large electrical concerns whose annual requirements for machine screw sizes of nuts ran into millions. Fig. 119 shows the principle. Tap holder body *A* is made in longitudinal halves, through which a quarter-turn hole *B* is worked out in halves, to a diameter 0.010 in. greater than the long diameter of the nut. Tap *C* has a 90 deg. shank bend, and its longitudinal centerline coincides with the centerline in hole *B*. The tap shank diameter is 0.005 in. less than the root diameter. Previously tapped nuts are loaded on the tap shank, causing the tap to "float" central in its holder. The holder revolves; the bend drives the tap, and with the hopper magazine *D*, both are operated horizontally in a small lathe. The magazine holder *E* is reciprocated to and from the tap, against stops, by an attached hand lever, not shown. Short quick movements on the hand lever, against the stops, cause the blank nuts in the hopper to arrange properly, and to enter magazine *D*, and then to fall and register in line with the tap at position *F*. Moving the hand lever forward feeds the blank nut to the tap, and when the nut passes over the cut, it forces ahead the load of nuts in the holder until one falls out at *G*. Two sliding retainers *H*, actuated by light compression springs, free one nut each time another one is threaded. A sheet metal hood, semi-circularly placed over the holder, causes the finished nuts to fall beneath. While this fixture does not always tap the nuts at perfect right angles to their faces, and not always from the blanking die side, it is nevertheless a high-speed contrivance, and the product is entirely satisfactory for practical purposes.

Bent tapping fixtures are sometimes arranged in multiples, under one deflector hood, for tapping two or more nuts in one strike. Like all other multiple fixtures, however, it is not always profitable to attempt using too many units together, because one or more of the fixtures in failing to function properly may tie up the production from those which are in good order.

Part XVI of Mr. Hinman's series on tool design will appear in an early number.



Figs. 117 and 118—Vertical-post tapping fixtures allow simple parts to be placed rapidly in position

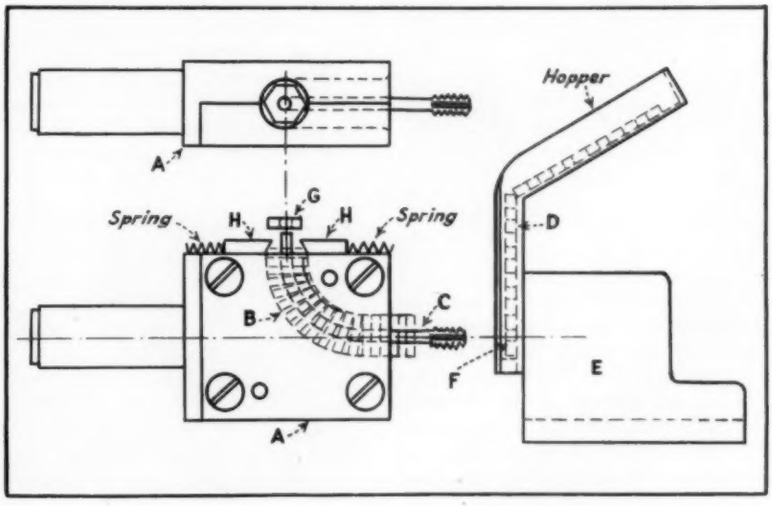
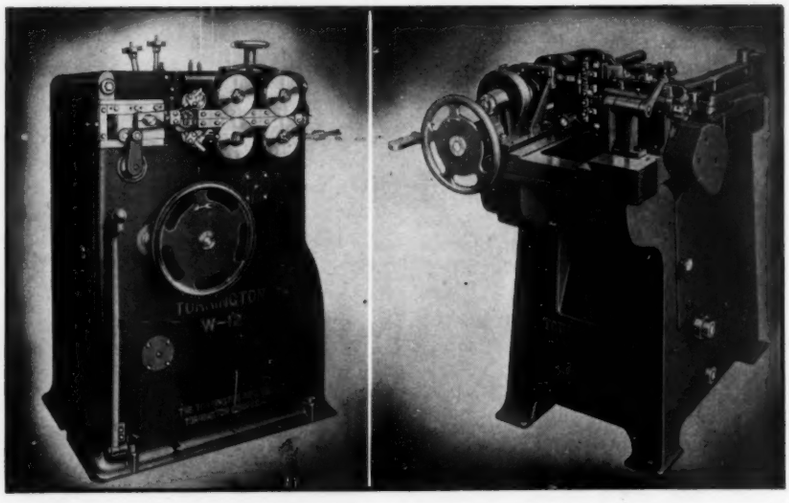


Fig. 119—As a nut passes over the bent-shank tap at *C*, a previously tapped nut drops from the holder at *G*

Shop Equipment News



Spring coilers are made in eight sizes. Operating controls are centralized so as to be readily accessible from the operating position A forming attachment that will form coil ends in any plane can be furnished with any one of the four sizes of torsion spring winders

Torrington Coil and Torsion Spring Making Machinery

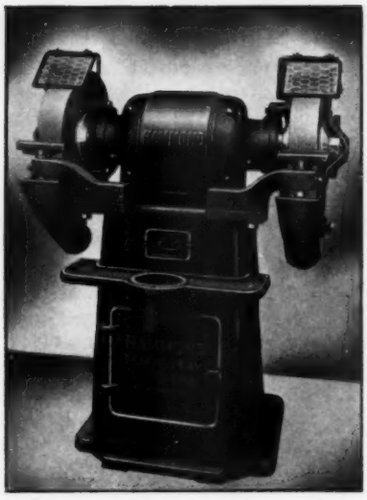
A line of coil and torsion spring winding machines has been announced by Torrington Mfg. Co., Torrington, Conn. Segment and clutch-type coilers are available in eight sizes, covering a range from 0.006 to $\frac{3}{8}$-in. diameter wire. Cutter shafts on these machines are adjusted axially at the front of the machine. Cam-compound levers are adjusted in the same manner and the diameter and pitch controls are manipulated by control screws at the top of the machine. The diameter slide is connected to its control by a solid link.

A wire feed adjustment, having a wedge-type locking gib operated by a single binding screw, has been incorporated in the segment-type machine. On the rear of these machines is a set of pick-off change gears, whereby the amount of wire feed may be increased above the rated capacity. Another set of pick-off gears, inclosed in the front of the machine, permits changing the operating speed to suit the coil being wound. The cam shaft on both the segment and clutch-type coilers is mounted near the front of the machine, where it is accessible for cam adjustment.

On the clutch-type machines, the clutch feed is operated, both in engagement and throw-out, by a positive action. This, in conjunction with an adjustable brake, is claimed to result in an accurate control over the amount of wire fed into each spring. These machines can be equipped with a long-spring attachment, with which any length of spring may be coiled, as the cut-off is manually controlled. Change gears are of the fixed-center type and the operator is required only to mount the proper change of gears on fixed studs at the rear of the housing, without adjustment.

The smaller sizes of clutch-type machines may be equipped with a sliding-gear box in place of the change gears. This gear box carries a number of changes that are suitable for the entire range of the machine. The clutch-type machine, like the segment type, is equipped with pick-off gears inclosed at the front of the machine. Each of these machines will take all wire sizes within its capacity without change and is designed to make all types of compression and tension springs with standard equipment regularly furnished.

Torsion-type spring winding machines are available in four sizes, covering a range from 0.006 to $\frac{1}{4}$-in. diameter wire. Spindle drive of these machines is based on a combination of cam and compound levers. This gives control over the number of coils in the spring and allots time in the cycle of the machine for the end-forming operation. Standard machine is equipped with cutter slides that will form projected ends on one plane. The machine can be equipped, however, with a forming attachment that will form ends in any plane. Wire-feed mechanism is designed for accurate control over the amount of wire fed into the projecting ends of the spring for which the winding machine is set up.

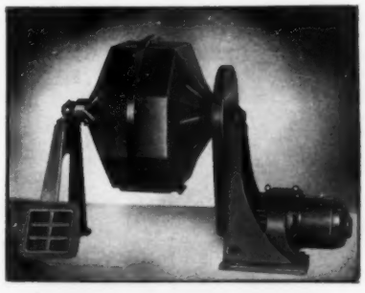


Hammond Grinders

Hammond Machinery Builders, Inc., Kalamazoo, Mich., has equipped all of its grinders of 3 hp. and over with totally inclosed fan cooled motors. Rotor and stator are placed in an inclosed chamber, sealed against entrance of foreign matter. Two fans force cooling air around the outside. These grinders retain such features as automatic starters with thermal overload protection, oversize ball bearings and adjustable eye shields of shatterless glass.

Hartford Triple-Action Cutting Barrel

The "Triple-Action" cutting barrel, manufactured by Hartford Steel Ball Co., Hartford, Conn., has been equipped with a built-in motor drive. Features of the previous model have been retained, such as the fully shielded roller chain and sprocket

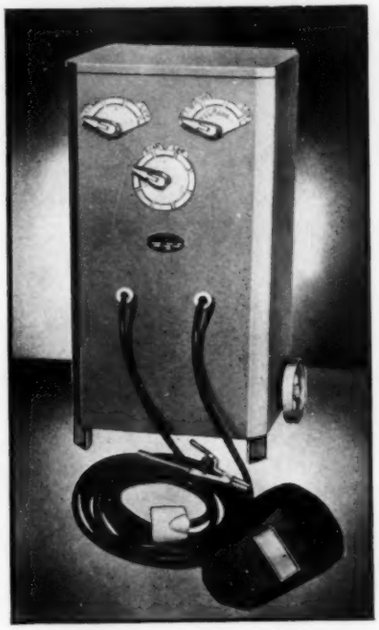


drive, self-aligning ball-bearing pillow blocks and automatic pressure-release valve. This barrel is claimed to be suitable for cutting down, wet and dry grinding, tumbling, pulverizing and mixing operations.

Specifications: capacity, 10 cu.ft.; shipping weight, 1,650 lb.; height, 48 in.; width, 36 in.; length, 75 in.

Miller "Dual Control" A.G. Arc Welder

The "Dual Control" a.c. welder, offered by Miller Electric Mfg. Co., Appleton, Wis., has separate voltage and amperage controls which enable the operator to select the most desirable voltage for the amperage used on any job. Practically unlimited current settings are obtained with the three dials on the front of the cabinet.



Welder is built in three sizes with a current range from 10 amp. to that required for heavy sheet metal. All three sizes are equipped with wheels for portability and have the same cabinet dimensions. Weight varies from 235 to 350 lb

Westinghouse "Midget-Marvel" Welder

Designed for use in maintenance and repair as well as light production welding, the "Midget Marvel" a.c. welder offered by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has twelve points of current adjustment which range from 30 to 140

amp. This set is designed for use with coated electrodes ranging from $\frac{1}{8}$ in. to $\frac{5}{32}$ in. in diameter.

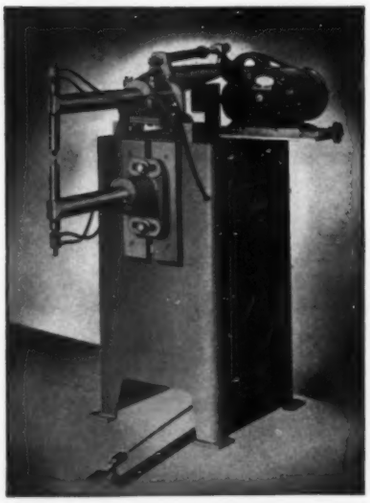
Welder is equipped with casters and is easily portable. The 60-cycle set weighs 112 lb.; the 50-cycle set, 130 lb. Dimensions: 14¼ in. high, 10¾ in. wide and 17⅞ in. long.

Durez No. 113 Black Molding Material

Developed for radio cabinets and other large housings where appearance is important, Durez No. 113 Black, a molding material announced by General Plastics, Inc., North Tonawanda, N. Y., has a rich black color and permits the molding of long draws with a smooth lustre. Parts molded from this material can be hard buffed without danger of showing filler-spots.

Federal Type "R" Spot Welder

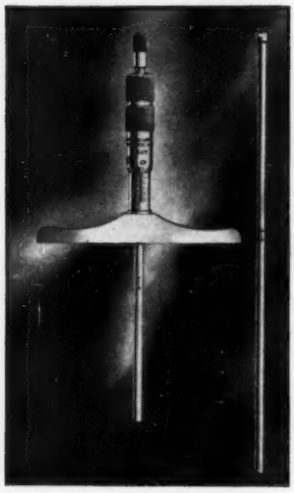
Type "R" spot welders, manufactured by the Federal Machine & Welder Co., 212 Dana St., Warren, Ohio, are available as automatically operated units, as illustrated here, or as foot-operated units. This series consists of eight spot-welding machines ranging in capacity from 7½ to 60 kva. Horn diameters range



from 1¾ to 2¾ in. diameter and throat depth ranges from 6 in. minimum to 48 in. maximum by increments of 6 in. Electrodes are water-cooled and range from ⅞ to 1¼ in. diameter.

The automatic-drive unit has a variable-speed arrangement which allows 30 to 90 or 72 to 216 strokes

per min. depending on the gear reduction unit used. Face plates are made of hard rolled copper. Lower horn socket has a 6 in. adjustment with the horn socket as shown, or an 8 in. adjustment with the horn socket reversed. An eight-point regulator switch on the transformer controls secondary voltage and current to suit the particular work at hand.



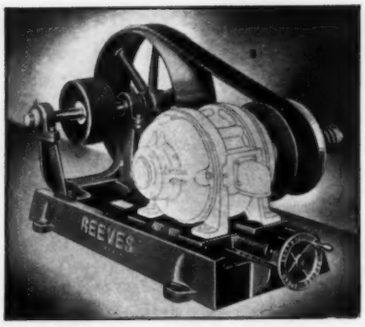
Brown & Sharpe No. 607 Micrometer Depth Gage

Having a range of 3 to 9 in., the No. 607 micrometer depth gage announced by Brown & Sharpe Mfg. Co., Providence, R. I., has a screw movement of 1 in. The full range is obtained by the use of six measuring rods. These rods are 3/16 in. in diameter and have hardened ends. The desired rod is quickly inserted in the gage through a hole in the micrometer screw. Base is about 9/16 in. thick and 4 in. wide. It is hardened and ground.

The No. 607 RS micrometer depth gage has the same features as the No. 607 gage, with the addition of a ratchet stop. Both of these gages are graduated in thousandths of an inch.

Goodrich Koroseal-Coated Paper

Koroseal-coated paper, made by B. F. Goodrich Rubber Co., Akron, Ohio, is designed for the protection of exposed surfaces of machinery which may be attacked by salt air. The paper, which is coated with a thin layer of koroseal, a rubber-like substance, is claimed to be impervious to acids, oil and air, and is light resistant.



Reeves "Vari-Speed" Motor Pulley

Design of the countershaft-type "Vari-Speed" motor pulley, offered by Reeves Pulley Co., Columbus, Ind., has been improved by mounting the pulley on the countershaft between the two bearing housings, thus providing a more compact unit. While a straight-face pulley is illustrated, power take-off may also be from sprocket, pinion, multiple V-belt, sheave or any other accepted drive.

The "Vari-Speed" motor pulley is a compact variable-speed unit which is mounted on the standard shaft extension of any constant-speed motor. Through handwheel control, a sliding base on which the motor and unit are mounted is moved forward or back, varying the diameters of a set of adjustable disks from which a V-belt runs to the driven pulley. This pulley is built in seven sizes, transmitting from fractional to 7½ hp., and covering speed ratios of three to one.

Hack No. 1-A Universal Diemaking Machine

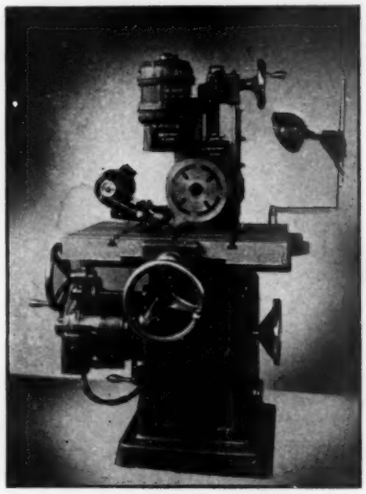
Designed to avoid the many set-ups on one machine after another, required in the manufacture of die parts, the No.1-A universal diemaking machine offered by Frank W. Hack, 440 North Oakley Blvd., Chicago, Ill., consists of a heavy base, a large compound table, a reciprocating vertical rear ram, a horizontal milling and turning spindle and a vertical head that is mountable on top of the rear ram. The rear ram is adjustable for stroke and position and can be locked in a stationary position when necessary. To this ram is fitted a screw-elevated master head to which other attachments are fastened.

Incorporated in this head is a back-geared milling spindle which is vertically adjustable within the ram. This spindle serves for both milling and turning operations. The vertical head is of compact, rigid design and is rotatable through 360 deg. In the vertical position, this head has eight speeds, four with back gear and four with open belt drive. When used in an angular position only the back-geared speeds can be used. Associated with this spindle, but removable from it, is a high-speed sensitive slotting head which can also be used for filing, lapping and other reciprocating operations. This slotting head is designed to function at any angle and has eight speeds. It can be used independently of the vertical spindle and, with the aid of an adapter, can be fitted to the master head.

A hacksawing frame is provided for attachment to the master head. This frame holds standard 8, 10 and 12 in. blades. It is used in connection with an elevated table which is interchangeable with the removable center plate in the table top.

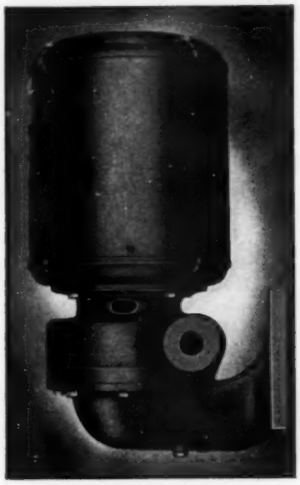
Drilling of large holes is accomplished with the vertical spindle. A 10 in. faceplate fits the master-head spindle, as does a 6-in. three or four jaw chuck. Stud turning, boring and facing can be accomplished with this spindle, in combination with a compound slide. Bore grinding of round dies is accomplished in the same way.

The reciprocating rear ram has a stroke adjustable from ½ to 3⅓ in. and a speed of 90 strokes per min. Heavy cuts are claimed to be possible with this ram. A standard grinding attachment, used with a simple adapter, is suitable for both vertical and horizontal grinding. Thus surface, bore, and cylindrical tool and cutter



grinding are possible. Plug, ring or snap gage grinding is also easily accomplished.

Specifications: Table size, 20x30 in.; table travel, front to rear, 10 in.; table travel, left to right, 16 in.; height of table above floor, 36½ in.; overhang of attachments, 12 in.; micrometer dials read to 0.001 in.; vernier scales on table movement read to 0.001 in.; auxiliary elevated table, 10x12x6½ in. high; maximum keyway capacity, 1 in.; maximum drilling capacity, 1½ in.; maximum end mill capacity, 4 in.; maximum cup-wheel grinding capacity, 4 in.; diameter of faceplate, 10 in.; maximum swing, 20 in.; stroke of die filer, 1 in.; jig saw capacity, 1½ in. tool steel; diameter of circular center plate, 11 in.; net weight, 2,500 lb. Main drive motor for ram and horizontal spindle is specified as a 3 hp., 2 speed, 3 phase motor. Auxiliary motor for vertical spindle drive is ¾ hp.



Pioneer Type VB Coolant Pump

Pioneer Engineering & Mfg. Co., 31 Melbourne Ave., Detroit, Mich., has introduced the Type VB vertical-bracket coolant pump, which bolts directly to the side of the machine-base or coolant reservoir. No suction piping is required, as the intake is directly through the base bracket. Relief or bypass valves are not needed in the delivery line. Any degree of throttling may be had without increasing the load on the motor. The pump and motor assembly is a self-contained unit which may be dismounted simply by removing the flange bolts. Any type of liquid, not too highly corrosive or viscous, may be pumped.

Olsen Light Capacity Stiffness Tester

A sensitive stiffness tester of 5 in.-lb. capacity has been announced by Tinius Olsen Testing Machine Co., 500 N. 12th St., Philadelphia, Pa. This instrument is suitable for determining the elasticity, plastic flow, hardness and bending strength of very fine wire, thin sheet, foil, plastic film, paper products and other thin and flexible materials. It is claimed that tests can be quickly made by unskilled operators. Uniform testing speed is provided by a self-contained motor drive. Visual scales show the angle of bend continuously, as well as the corresponding load, which is weighed by a pendulum.

Signode Electric Strapping Tool

Signode Steel Strapping Co., 2600 N. Western Ave., Chicago, Ill., offers an electric strapping tool for tensioning strapping around large and heavy packages and bulk shipment of material where speed in applying the maximum tension is necessary. This

tool is powered with an a.c.-d.c. reversible electric motor. An adjustable control provides the required tension automatically, eliminating guesswork. The reversible motor permits backing the tool off the strap.

This tool operates with either hand, and has finger-tip control. Full-length base has rounded front edges to permit the tool to ride smoothly over cross-strapping or other uneven surfaces of the container being strapped.

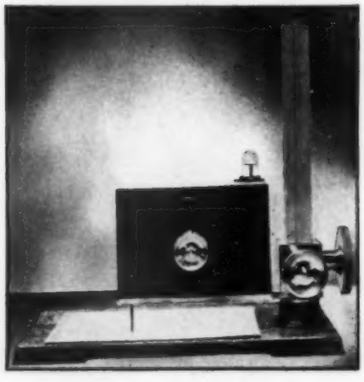
G. E. Cartridge-Type Heating Unit

A small cartridge-type heating unit, announced by General Electric Co., Schenectady, N. Y., is designed for providing a spot of heat within a limited space. This unit is only ⅜ in. in diameter and is manufactured with brass sheath for maximum operating temperature of 750 deg. F. It is available in ratings of 30, 75, and 90 watts at 115 or 230 volts, a.c. or d.c.

American "Nickel-Coating" Thickness Tester

Local thickness of an electroplated nickel-coating on a non-magnetic base metal may be measured with an instrument announced by the American Instrument Co., 8010–8020 Georgia Ave., Silver Spring, Md. The method employed with this instrument involves the measurement of the force required to detach one pole of a permanent magnet from the nickel coating. Comparison of this force with that required to detach the same magnet from a similar nickel coating of known thickness gives a direct reading of the thickness of the plated coating.

This instrument uses the method described by Abner Brenner of the National Bureau of Standards in Research Paper RP994. Information on



this method is given in a recent Reference Book Sheet (*AM*—Vol. 81, pages 707–708).

The instrument is calibrated with nickel coatings of known thickness which have been deposited under about the same conditions as the coatings to be tested. Nickel coatings deposited under different conditions have somewhat different magnetic permeabilities, but if such coatings are annealed at 750 F. they acquire about the same permeability.

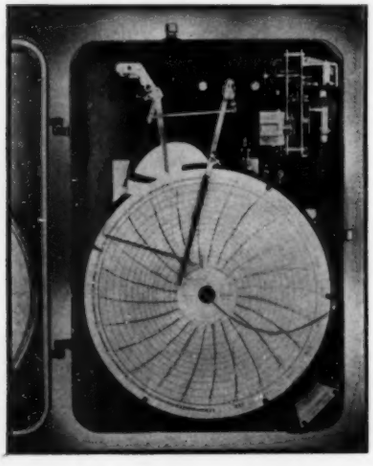
Measurements on coatings as deposited are claimed to be correct within 15 per cent and within 10 per cent on annealed coatings. This method is rapid and non-destructive, and its accuracy approaches that of metallographic measurements for thin coatings.

The instrument is equally applicable to plane, convex and concave surfaces and the presence of the usual thin chromium coatings over the nickel has no appreciable effect on the thickness measurements. The instrument measures 5x8x9 in. and weighs 7½ lb. without carrying case.

Bristol Flow-Meter "Electric Integrator"

The electric integrator, developed by The Bristol Co., Waterbury, Conn., for use with flowmeters, totalizes flow once every 15 sec. Mechanical and electric flowmeters for measuring the flow of a gas or non-viscuous liquid through a closed line are now equipped with this integrator.

A flat disk cam is designed to coincide with the flow law, so that it mechanically computes the square root of the differential pressure across an orifice plate or venturi tube constriction in a pipe line at 15-sec. intervals. Values thus obtained are totalized by means of a counter.



Kingsbury Solenoids

Model 150–1 and Model 32–269 a.c. solenoids, originally perfected for use with drilling heads, have been made available to manufacturers of other machinery by Kingsbury Ma-

chine Tool Corp., Keene, N. H. Coil is rigidly mounted in a steel case and impregnated with an oil and moisture resisting compound.

Construction is said to be such that the character of the pull-curve can be made to meet individual requirements. Model 150–1 has terminal towers molded integral with the coil bobbin flanges. The case, pole piece and plunger are made of low-carbon steel bar slotted to reduce eddy currents. Model 32–269 has lead wires instead of terminals and is more compact. In both models a magnetically shielded, helical return spring is used.

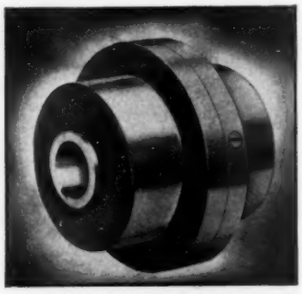
Metzgar "End-Wood" Sheave Wheels

Metzgar Co., 105 Logan St., S. W., Grand Rapids, Mich., is now offering sheave wheels of end-wood construction similar to that used in the truck and caster wheels that have been marketed for a number of years. These sheave wheels can be made with hubs for keying to shafts or can be fitted with oilless end-wood bearings, ball bearings, or roller bearings.

These sheaves are made of selected hard maple that has been chemically treated and are claimed to be quiet in operation. No standard sizes are to be carried in stock, the sheaves being made up to customer's specifications.

Rybeck "Full-Floating" Flexible Coupling

The T. L. Smith Co., 2801 N. 32nd St., Milwaukee, Wis., has announced improvements in the Rybeck "Full-Floating" flexible coupling. Ring shaped springs which transmit the



torsional loads, have been replaced by laminated springs. Type of construction is claimed to absorb shock and vibration. Housing is equipped with packing to retain lubrication for long periods of time. Horsepower rating at 100 r.p.m. ranges from 0.9 to 130 hp.

Hannifin Series LO Air Cylinders

Series LO heavy-duty air cylinders, offered by Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago, Ill., have a mirror finish bore that is claimed to be straight, round and concentric. The improved piston fit is claimed to give high efficiency and economical

use of air power. Flanges are screwed on and then welded to the cylinder body. Heads are cast steel and are available with or without air cushion at either or both ends. Standard sizes, up to 16-in. bore, for any length stroke and for air pressures up to 250 lb. are available.

Round Table

New Man

"Who's the man Jim Taylor is taking through the shop, Al? I haven't seen him around before."

"That's a new lathe hand in Jim's department. His name is Walter Barnes—came here from Cleveland a couple of weeks ago and seems to know his job."

"What's the sightseeing trip for, then? It seems to me that a lathe hand should be running a lathe rather than gossiping with the foreman."

"We're trying out a new scheme, Ed. By the time a new man has been with us a month we want to be sure that he fits into the organization and is familiar with all of the work we do."

"That must take up a lot of your foremen's time, Al. I thought they already had plenty to do."

"Of course, the foreman has to spend a lot of time with his new men, but one of his most important functions is to train his men and keep them on their toes."

"Maybe your foremen can find time for such things, but I've plenty to do now. The new men in my department are shown where they are to work, what they are to do and where to keep their tools. From that point on it is their job to learn the ropes as best they can."

"Have you ever given thought, Ed, to the cost of all the time wasted because new men had to be re-directed after they had been left to find their own way?"

"Probably amounts to a sizable figure, Al, but we foremen are still hired to keep all of the men producing, not to nurse the beginners."

"Listen, Ed, one of the first things we want in a trained mechanic is judgment—ability to decide for himself, correctly, which method to pursue in performing work assigned to him. A new man may have much experience in similar work and yet be unable to exercise his judgment—all because he does not know the purpose of the part he is making. My idea is to take advantage of his ex-

perience at the earliest possible moment."

"But if he makes the part according to instructions there is no need for him to know where the part is to be used; why isn't it better to have him spend his time in productive work?"

Is Al right in asking his men to become acquainted with all operations in the shop? Or does it disturb shop routine to no avail?

Discussion

Private Lives

Many men object to the type of application blank that asks personal questions of the kind that put a man on the defensive. It is not that he actually minds answering the questions, he simply does not consider them of any importance when it comes to getting a job. If he is really in need of work, he may put down the answers he believes the employer wants.

After all, what difference does it make whether or not a man owns his own home, has money in the bank or attends some particular church? The all-important question is: Can this man do the work and do it right?

I cannot agree with Ed that the answers to these questions indicate a man's steadiness. In every community there are men who seem to have a natural talent for saving money and there are others, just as honest and capable, who never seem to gain material wealth. It would hardly be fair not to employ these men simply because they have not the ability to put money aside.

The employer is probably partly to blame for many of the misrepresentations of facts given in answer to questions on application blanks. In the older days a man was hired because he could do a certain job, not for the number of years he had piled up. Perhaps all this lying can be blamed on the depression, because during the past few years men have been told that they were "too old" so many times that it wore down their resistance. Lying to get a job did not seem the crime they once thought it was, although I am sure that when

they got a job by this means, their consciences have bothered them more than they would like to admit. Most men are innately honest and hate deception. — HUGH MUIR MITCHELL.

Too much caution cannot be exerted by the employment department in ascertaining the personal qualities and moral, physical and mental characteristics of applicants. What the below-standard applicant lacks in academic intelligence, he usually makes up in elementary shrewdness. For that reason, unfit applicants soon spot the places of employment where no questions are asked and no physical examinations are required.

In consequence, these shops soon become loaded with men possessing negative mental attitudes and men who are not physically fit. It is not uncommon for some of these men through application and industry and the ability to sell themselves to not too intelligent superiors, to be promoted to supervisory capacities where they do an unestimable amount of damage before their detrimental influence is suspected.

Intelligent and responsible workers are quick to sense conditions in these shops and immediately look elsewhere for employment. If a company is interested in building up a satisfactory personnel, the most rigid investigation of an applicant's qualities should be made. —IRA S. WILLIAMS.

The hiring of a new employee involves a contract, whether written or not, wherein the employee sells to the employer his time, ability and whatever experience he may have acquired. This contract involves a definite investment on the part of the employer, as all new employees require training in addition to the actual cost of hiring.

Obviously the employer is entitled to information on which he may base his justification for the investment. This is small enough protection, for, while the average man may be inherently honest, it is often surprising how much an employment application blank can affect the imagination. An employment manager who mentions religion to applicants can convert more atheists than an evangelist—until the job is landed.

On the other hand, the applicant has certain demands and usually investigates the conditions under which he will work. The difference is that he invariably acquires this information prior to his appearance at the employment office. I have yet to have a man ask if he might inspect the shop before placing his application. The first man to do so gets hired on the spot, for I know that I can expect first class work from a man who demands good equipment and good conditions.

—GILBERT G. COOMBS.

With the exception of a few pertinent questions, for record purposes, I hardly think it justifiable to attempt to catalog every personal characteristic of an applicant for a job. Lengthy questionnaires do not act as correctives in the event an applicant has been at fault in the past.

Attempting to learn how large a bank account or how much property one owns is not a reliable method of gaging efficiency and responsibility. There are many uncontrollable factors that may enter into the course of a competent man's life which may have influenced his economic status. If a man is earnestly seeking employment he is not going to expose any personal matters that may jeopardize his chances of securing a job.

An application blank having a lot of questions on it cannot take the place of a personal talk with the applicant by a competent interviewer.

—PETER L. BUDWITZ.

Play With Pay

In the past, holidays without pay have been a hardship for most workers, as this has meant a reduced pay envelope at the end of the week. A full week's holiday meant no pay whatever.

Relaxation for shop men is just as much a necessity as for others. From every point of view, vacations with pay are a desirable and economically sound concession for employers who can afford it.

There need be no dislocation in production if work is organized and vacations arranged in such a way that the duties of key men can be delegated to those who, in the event of their permanent absence or transference to other work, would be chosen to fill the vacancies thus created.

—W. L. WATERHOUSE,
Horfield, Bristol, England.

The Conscientious Workman

The conscientious workman is too apt to have the defects of his unquestioned qualifications. He is usually meticulously and indiscriminately painstaking. Both he and his employers suffer from his unregulated excellency.

There can be no question, however, if there comes a choice between too-careful and careless workmanship. Costs of work done by a too-conscientious workman may be somewhat higher than necessary, but on the other hand, costs of spoiled work may rise to dizzy heights. While Henderson, by proper guidance, may be brought to work according to relative values, it is unlikely that the habitually careless workman will readily acquire dependability no matter how carefully he is supervised.

The last thing that should be done is to undermine Henderson's carefulness. He should be shown how each job should be done and what the vital parts are. Once get him to understand the necessity for differentiating between fits and it is likely that he will become known as the most valuable man in the shop.

—W. R. NEEDHAM,
Stafford, England.

Too close a fit on parts is not desirable; a workman who wastes time making fits too close should be dealt with in the same manner as workmen who make fits too loose. The fault with Henderson may be that his instructions as to fits have been given verbally and he has taken the view that wasting time securing a close fit will be overlooked, but slack fits may mean discharge. If the nature of the fits required are put down on paper and the reasons explained to him, he will probably do the work as requested. —W. E. WARNER,
Sompting, Sussex, England.

Believe in Signs?

Putting safety measures across with as little fuss and excitement as possible is a sound principle. While machinery has been safe-guarded as far as the ingenuity of man has found necessary and possible, there are still many ways that people may be injured.

As a warning to everyone entering a plant, I believe a notice worded in a way that would attract the men's attention and serve as a warning that they must be watchful of hidden risks, will do much good. Such a notice should be very plain and placed where it could not easily be overlooked, but not so prominent or startling as to create fear or nervousness.

The faster pace set for practically all operations has brought additional risks that, in some cases, have not been adequately safeguarded. Where a known risk is present, it would be advisable to place a warning notice that plainly but clearly states the risk and advises the workman as to how to protect himself.

—MARTIN H. BALL

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Editorials

Don't Press

THOSE of us who have ever sought professional advice in our efforts to master the ancient and honorable Scottish game of golf have been admonished not to "press." A good sales manager warns his new salesmen to "relax" when in the presence of a prospect. The philosophy is the same in both cases. Someone ought to give the same warning to labor union zealots, and even to some employers.

When any group gets control of a situation it is faced with an almost irresistible temptation to grab for too much. The almost inevitable result is disaster. And it is so unnecessary.

Before the costly marine strikes on the Pacific Coast silk imports from the Far East meant work for American workmen, and profits for American railroads. The famous silk specials were the fastest trains on the rails, passenger limiteds were sidetracked to let them pass. Now they go across Canada.

Akron's rubber workers won what they wanted but had not sense enough to stop there. They continued to stir up trouble until now they are faced with a decisive move toward decentralization by the tire manufacturers. Michigan's automobile workers made the same mistake and forfeited the support of public opinion. They stand to lose all they have gained. Steel strikers learned nothing from the automobile experience and suffered an expensive and unexpected setback.

Some labor organizers have lost their heads and tried to lead their men farther than the men wanted to go. They have been replaced. Others have had their men get out of hand and go after things the leaders knew were impossible of attainment. The men have lost, and their leaders with them.

CERTAIN employers have won strikes, and have then pressed their advantage so far that what little morale was left evaporated. Every manufacturing enterprise is built on teamwork, and teamwork is built around leadership. When both are lacking success is far off.

Even those in high places pay the same penalty for pressing. Woodrow Wilson could have had the essentials of his league of nations scheme and ninety per cent of the details. He sacrificed all for ten per cent. Franklin Roosevelt could have had most of what he wanted in his court packing plan. Fortunately for the country he demanded all and aroused an opposition that cost him everything.

Don't press! It never pays.

Shops—West and East

EVERY time one crosses the Rocky Mountains and visits shops on the Pacific Coast he gets new evidence of the power of the great mountain barrier to separate that part of the country from the industrial East. One man will tell you how important it is for shop executives out there to get back east and learn what the progressive plants are doing. Another says that so-and-so went back and was amazed at the old machines he saw in some of the good shops. Still another remarks that the last machine tool show had lots of splendid machines for the automobile builders but nothing new for the contract shops like those on the Coast. And almost everyone remarks that of course his shop must look pretty inadequate compared to those in the industrial area.

As a matter of fact, there are just as many badly equipped shops in the East as there are west of the Rockies, in proportion to the total number of shops in each region. When a Coast shop official goes east he should pick carefully the shops he is going to visit, passing up those that are not up-to-date. In the good shops he will find ways of doing things that may be new to him. Even if he can't adopt them he may be able to adapt them.

It is a mistake for any man in the metal-working industry, west or east, to spend all his life in one plant or one city without ever getting around to see what the other fellow is doing. If he does he is likely to discover that the world is leaving him behind, that he will have to hustle to catch up.

CHIPS

WASHINGTON

Black to replace Van Devanter . . . Senate approves after bitter wrangling . . . Alabama governor's wife to replace Black . . . Roosevelt continues pressure to keep budget balanced . . . Charges critics with a distrust of rule by majority in Roanoke speech . . . Adjournment rush is on as House suspends rules . . . Does not even read tax-loophole-plugging bill before passing . . . Passes last appropriation bill of session, adding $20,367,500 to government cost in spite of Appropriation Committee appeals . . . Provides $20,000,000 for retirement of submarginal lands and farm tenancy programs . . . Jacks up Senate's unit price from $4,000 to $5,000 and decreases 20 per cent limit for each state to 10 per cent before passing Wagner Act . . . Senate committee approves new governmental re-organization bill to be presented formally at the next session. . . . Senate saves portion of Administration's plans by passing separate anti-child labor law as House promises Black-Connery Wages and Hours Bill up next session . . . U. S. and Brazil continue with plans to lease six destroyers although formal bill will not come up this session . . . Department of Commerce export tables reveals China began heavy purchases of war materials months ago . . . Representative Fish demands return of marines and withdrawal of 10 ships from Chinese war zone.

FOREIGN

Shanghai being devastated by bombs and artillery fire as China fails to turn the other cheek as heretofore . . . Japanese warships remain in harbor firing pointblank into the city . . . China sinks six ships in the harbor to prevent moves further up the Whangpoo river . . . Japan closes embassy in Shanghai, calls civilians to colors at home . . . U.S. evacuates women and children first as Hull decides that it is too late to call up neutrality pact . . . Spanish rebels only 28 miles from Santander as drive continues . . . Arrival of seaplane Nordmeer latest German bid for North Atlantic airplane trade . . . Meanwhile Pan-American and Imperial Airways continue trips to and from England without fanfare . . . Paraguay follows Bolivia in abandoning state socialism . . . Will return to constitution of 1870. . . . Japan dominates Northeastern Hopei province with key cities, Tientsin and Peiping, under its control . . . Germany and England send each other's news correspondents home . . . Portugese break diplomatic relations with Czechs because they refuse to deliver arms ordered . . . Hint Russia the cause.

FINANCE

S. E. C. rules impair liquidity of stocks according to Gay, president, New York Stock Exchange . . . Criticism ignored by S. E. C. and Federal Reserve System . . . Tydings-Miller Price Maintenance Bill becomes law as President expresses hope that increases in consumer prices will not be as high as he fears . . . War in China raises wheat prices, causes uneasiness in stock market . . . Hendey Machine Co. directors vote to sell up to 50,000 shares Class B stock. . . . E. W. Bliss and Bullard are other companies refinancing.

INDUSTRY

Rally by employees backs Weir's stand against N.L.R.B. . . Strikes in New York Shipyards near end as C.I.O. considers dropping fight if workers' rights are protected . . . 5000 Philadelphia Navy Yard employees vote to pick bargaining representatives as C.I.O. protests . . . Green plans counter-attack on C.I.O. to organize white-collar workers and agricultural groups . . . Bumper grain crops at good prices bring rush of farm equipment orders that cannot be filled . . . International Harvester with 60,000 employees at highest employment mark of career . . . Oliver Farm Equipment reports foreign sales at a peak. Studebaker standard six is third auto engine to be approved by Department of Commerce for airplane use . . . Shark oil, good for 45 degrees below zero, lubricates Japanese plane motors.

INDICATORS

Steel production drops 1.4 to 83.2 which is still higher than last month's rate of 83.5 . . . Electric power output jumps to 109.6 contrary to seasonal trend . . . Business Week index stands at 78.8.

J. J. Duggan Elected Head of Chapman Valve Company

John J. Duggan, for the past 21 years treasurer, Chapman Valve Mfg. Co., Indian Orchard, Mass., has been elected president and general manager to succeed the late Thomas F. Maher. Frederic C. Low will replace Mr. Duggan as treasurer. C. Goodwin Carter, son of E. A. Carter, chairman of the board, has been elected a director to succeed Mr. Maher.

Plan Second Porcelain Enamel Institute Forum

Having scored a success with its first forum, conducted at the University of Illinois, May 5-7, the Porcelain Enamel Institute plans a second to be held at Ohio State University, Oct. 13-15. Plans for this meeting are rapidly nearing completion, according to F. E. Hodek, Jr., General Porcelain Enameling & Mfg. Co., and vice-president of the Institute.

Speakers have not yet been announced in the tentative program. However, the three-day meeting has been divided into general sessions which include discussion of enamel shop costs, incentive systems for enamel shops, and safety and plant maintenance. Another session will be devoted to welding, drawing and cleaning compounds, nickel treatment of enameling iron, and enamel process inspection and repair.

The closing session will be divided into three groups: hollow-ware, with a discussion on pickle room practice and control and consistency of enamels for dipping; cast iron, with discussion of blast furnace practice, molding practice and cleaning practice; sheet iron, with a discussion of cleaning and pickling practice, ground coat dipping, control and consistency of enamels for spraying.

A.S.T.M. Forms Committee to Study Tests of Plastics

The American Society of Testing Materials has formed Committee D-20 whose scope is to be the development of test methods applicable to the finished product (molding materials, sheets, tubes and rods, and molded or fabricated articles) in the field of plastics. Excluded from this group are electrical tests and plastics used in the paint industry and rubber industry.

W. E. Emley, chief, Division of Fibrous and Organic Materials, National Bureau of Standards, was elected chairman. Bjorn Andersen, technical director, Celluloid Corp., is first vice-chairman. T. Smith Taylor, manager, Engineering Laboratory & Experiment Dept., Diehl Mfg. Co., is second vice-chairman. W. A. Evans, telephone engineer, Bell Telephone Laboratories, Inc., is secretary.

Approximately 30 companies are represented on the committee which is divided into five subcommittees with the following chairmen: subcommittee on strength properties, H. M. Richardson, General Electric Co.; subcommittee on hardness properties, J. C. Pitzer, Formica Insulation Co.; subcommittee on thermal properties, L. M. Currie, National Carbon Co.; subcommittee on optical properties, H. W. Paine, E. I. du Pont de Nemours & Co.; subcommittee on permanence properties, G. M. Kline, National Bureau of Standards.

A. A. R. Plans Coordination of Railroad Research Work

The Association of American Railroads has established a division of engineering research to expand and coordinate research work now being carried on by the railroads of this country, in so far as it affects the physical properties. According to J. J. Pelley, president of the association, this division will supplement and correlate the test work of the various individual carriers dealing not only with all mechanical facilities, but also with metallurgical and physical problems, as well as fuel, water, paints and other material and supplies.

This new division will absorb the work now being performed by the Division of Equipment Research which was organized several years ago. L. W. Wallace has been appointed director of the Division of Engineering Research. G. M. Magee, assistant engineer, Kansas City Southern, has been appointed assistant director.

Steel in Pictures

U. S. Steel Corp. is making a three-reel industrial educational film in color and sound. Twenty steel plants are expected to figure in the production of the film costing more than $200,000.

Beginning with the mining of raw ore at Hibbing, Minn., every phase of the manufacture of steel will be covered in an eight weeks film itinerary which will end at Pittsburgh.

Chemical Machinery to be Shown at Chemical Industries Exhibit

The Sixteenth Annual Exposition of Chemical Industries will include not only exhibits of raw materials and chemical products, but also all types of machinery used in the manufacture and handling of chemicals of various kinds. This year's exposition is being held in the Grand Central Palace, New York, December 6–11.

Included in the displays of chemical materials will be various types of finishes and plastics. One display is to be devoted to a demonstration of the use of gases in refrigeration and general industry.

Principal sections of the exposition will include chemical products and raw materials; general plant equipment; processing machinery, pumps, piping, hydraulic accessories; materials handling equipment; containers and packaging; laboratory equipment and supplies; instruments of precision; metals and alloys; synthetic plastics. Included in the machinery display will be such machines as crushing and grinding machinery, vibrators and ball and pebble mills. Other sections will show evaporators and drying machinery.

This exposition is under the direction of Charles F. Roth, president, International Exposition Company.

A.I.E.E. Announces Program For Pacific Coast Convention

A trip to the Grand Coulee Dam and one to the Coeur d'Alene mining district is included as a part of the program of the Pacific Coast Convention of the American Institute of Electrical Engineers which is being held in Spokane, Washington, August 31–September 3. Included in the area to be covered by the inspection trip is one of the world's largest electrolytic zinc plant for the treatment of zinc ores located at the Sullivan Mining Co. plant near Kellogg, Idaho. Alvin F. Darland, United States Bureau of Reclamation, will address the group on this trip.

Included in the program are sessions on the development of protective equipment, power transmission and distribution, electrical machinery. In addition a joint communication session will be held with the Institute of Radio Engineers. Arrangements have been made for two student technical sessions. A banquet with presentation of prizes will close the formal program of the meeting.

Apex Company to Enter Air-Conditioning Field

Savage Arms Corp., which has been manufacturing air-conditioning equipment since 1926, has sold its Zephyr air-conditioning division to Apex Electrical Mfg. Co. Machinery will be moved from the Savage plant in Utica, N. Y., to Cleveland, according to C. G. Frantz, president.

Apex intends to specialize in the field of home air-conditioning. Units will be built so that summer features may be installed with the winter units or added later.

Bids on New Ship Will Be Opened September 15

Bids on a ship for the United States Lines to replace the Leviathan will be opened September 15. Construction of this ship is being subsidized under the Maritime Act of 1936, which provides that the builder-owner pay 25 per cent during construction, and upon completion he give notes for the balance of what the ship would have cost in principal foreign yards, less what he has paid. Notes run 20 years at 3½ per cent. It is expected that the ship will cost between $13,000,000 and $15,000,000.

The Maritime Commission has released information that the power plant will consist of two sets of triple series turbines: high, low and intermediate. Speed at high pressure will be 3300 r.p.m. with double reduction down to 128 shaft r.p.m.; for intermediate and low pressure, speed will be 1500 r.p.m. with single reduction to 128 shaft r.p.m. Normal shaft horsepower is to be 34,000. The electric plant is to have four, 600 kw. d.c. sets for ship auxiliaries and lighting circuits.

Refrigerating machines using freon gas will supply the cold boxes, cargo and storage. The cargo refrigerating unit will also be a standby for the ship's air conditioning set.

George G. Sharp, naval architect well known for his development of fire-resistant boat construction, designed the ship. This is the second ship which the Commission is having built under regulations which are claimed to make it absolutely fireproof.

Plans call for almost a complete riveted structure with little welding to be used.

First National Trailer Show

Manufacturers of trailers and accessories are planning the first annual National Trailer Show under the sponsorship of "Industrial Shows," 250 W. 57th St., New York City. Show is to be held in the 71st Armory, New York City, September 10–15.

Heretofore exhibits of trailers have usually been held in conjunction with the National Automobile Show. The association advertises space rates of $1.50 per sq.ft. and expects that, by holding its own show, costs will be reduced to the exhibitors and the trailer manufacturing industry will take its place as a front-rank enterprise.

Peck, Stow & Wilcox Company Traces History Back to 1785

Recent investigation for a prospectus for government purposes showed that one branch of the Peck, Stow & Wilcox Co., tools, hardware and sheet metal machinery, had been founded in 1785, whereas 1819 has been commonly accepted as the year in which the company had its origin.

Elias Beckley, Jr., began this first branch with the manufacture of tools in Berlin, Conn. Eventually he formed the J. & W. Bulkeley Co., which sold out to Lyman Wilcox, maker of snip and bench shears, in 1844. Later Mr. Wilcox and Franklin Roys formed the Wilcox Co., which from 1855 to 1870 added tinners' and mechanics' tools and machinery and hardware items to its manufactures.

Seth Peck established a business for the manufacture of his tin wire-making machinery in 1819 and in a few years was selling a complete line of sheet-metal machines. After several changes the Peck, Smith Mfg. Co., was organized. It was this company that merged in the Peck, Stow & Wilcox Co. in 1870.

Solomon Stow started with the manufacture of machine parts for Seth Peck & Co. in Southington in 1834. He later purchased the plant of Neal & Co., and organized as S. Stow Mfg. Co., prior to merging with Peck and Wilcox. Roswell A. Neal was largely responsible for bringing the new company into being.

Since that time the company has purchased Willcox & Treadway, Cleveland, and C. H. Stoll, Inc., Buffalo, N. Y., and consolidated all of its activities at Southington, Conn.

Index of Machine Tool Orders

Month	Based on Volume of Shipments for 1926 Index of Orders: Domestic	Foreign	Total	3 Months' Average Index	% Foreign to Total Orders
1936 — August	96.1	31.4	127.5	135.5	24
September	82.9	35.6	118.5	132.0	30
October	105.4	31.1	136.5	127.5	23
November	110.7	36.4	147.1	134.0	25
December	205.7	52.0	257.7	180.4	20
1937 — January	156.1	44.0	200.3	201.7	22
February	122.4	42.8	165.2	207.7	26
March	172.1	39.5	211.6	192.4	18
April	232.5	50.0	282.5	219.8	18
May	161.4	47.1	208.5	234.2	22
June	137.6	54.2	191.8	227.6	28
July	115.4	55.7	171.1	190.5	32

Distribution of Orders

Average Indexes of Individual Companies Based on 1926 Level of Business	Companies In Per Cent of Total Number Reporting: 1936 2nd Quar.	1936 3rd Quar.	1936 4th Quar.	1937 1st Quar.	1937 2nd Quar.	1937 July
200–up	17.2	15.8	28.4	31.6%	38.5	29.9
100–199	32.6	28.8	30.2	32.8	29.1	33.6
60– 99	19.0	22.9	19.5	16.4	15.1	16.4
20– 59	21.8	21.7	15.2	12.2	11.4	11.9
Less than 20%	9.7	10.8	6.7	7.0	5.9	8.2

Machine Tool Orders Drop For Third Successive Month

With the Index of Machine Tool Orders down to 171.7 for July, sales still are higher than for any month from November 1929 to November 1936. From the statistical viewpoint this drop, large as it may seem when compared with April's Index of 282.5, has not broken the basic upward trend begun in August, 1934.

Foreign exports accounted for about one-third of the business and at the present time stand at the highest figure since a record of foreign orders was begun in January 1930.

It will be noted from the distribution of orders that almost 30 per cent of the companies still have indices of 200 or more. The general distribution of business is still fair.

WATCHING Washington

Congress adjourns with much of Administration program uncompleted . . . Higher taxes loom for next session . . . Relief cuts resisted . . . China-Jap outbreak discloses Neutrality Act Weakness

WASHINGTON — Congress has adjourned at last; may it rest in piece. Taking a quick backward glance at the accomplishments of the legislators, it must be admitted that while they did not achieve a great deal in the direction of enduring legislation, they did do several things which may prove of permanent good. Foremost among these is the damage done to the greatest drive that has ever been made against our democratic form of government.

There are several hangovers from the President's program, as announced on June 5 after a conference with congressional leaders. Besides the wage-hour bill they include: government reorganization (which the President will probably never get the way he wants it); national planning (generally regarded as the Norris seven TWA's); and Supreme Court enlargement (which he may decide to ignore, but probably will push in some form or another).

The tax loophole bill was passed by the Senate in 60 seconds. This measure, understood by virtually no one except Treasury experts, is expected to stop tax evasion totalling $40,000,000. According to Representative William D. McFarlane, of Texas, however, the real loopholes are left open.

Tax Battle Looms

Upward revision of federal taxation, which will be urged by President Roosevelt at the next session of Congress, may develop a battle approaching the fundamental character of the Supreme Court fight. The Treasury has indicated that it will have a measure already drafted when Congress convenes in January, assuming that no special session is called.

All the early session talk about economy and balancing the budget has long since blown out the window. Congress appropriated plenty more than the budget. Federal housing is just starting and will expand.

However, the biggest item of all is relief. Harry Hopkins rages at the idea of Congress appropriating only 1½ billion for relief, especially because of the proviso that this must run through the fiscal year. He had hoped for no strings—to spend the 1½ billion in six or seven months and then ask for a deficiency appropriation.

Every one of Roosevelt's tax proposals from the very beginning has contained just as much social and economic reform as money-raising in its objectives. Next January's Treasury-drawn bill will be no exception. It will move again against bigness. It will strike anew at holding companies. It will seek to reduce further the wide discrepancies in the distribution of wealth.

When the Neutrality Act was under discussion certain weaknesses in it were brought to attention. One of the greatest of these was the fact that withholding supplies from both belligerants alike would have the effect of favoring the better prepared and more industrial nation. As the better prepared nation is in nearly every case the aggressor, the bill tends to favor the aggressor and thus condone the use of force in the assertion of territorial or other claims.

This phase of the Neutrality Act is strongly brought out in the current conflict between Japan and China. The Administration has avoided raising the issue by refraining from declaring that a state of war existed between Japan and China. Technically there may be no similarity between the situation in the Orient and that which existed in Ethiopia. Chinese and Japanese diplomatic representatives have not been withdrawn, and though there is actually conflict and bloodshed, the armies are not formally on the move. With increasing violence, however, it is a question just how long the Neutrality Act can be kept inoperative. Once it does become effective there is little doubt that it will aid Japan at the expense of China.

Expensive Education

When President Roosevelt signed the interior department appropriation bill, he stated that it was "with much reluctance" because of its vocational education provisions. The President pointed out that the vocational education program was "$10,000,000 more than the estimate of the bureau of the budget which I presented to Congress." He further stated that "Evidence was read into the records of the debate in both houses indicating that much of the impetus behind this movement emanated from a single interested source." There is little question that the "single interested source" to which he refers is the American Vocational Association which brought state representatives to testify before the senate committee on education and labor. Many members of the association as teachers and other functionaries benefit by the federal appropriations added to the state funds. The President is not only vexed with the vocation lobby, but he is out of humor with the Education Office itself. He has demanded again and again that it report just what is being done to relieve unemployment.

Black on the Bench

Radical Hugo Black on the Supreme Court in place of conservative Willis Van Devanter means that President Roosevelt's main problem next session will be to get what he wants from Congress, rather than to hope what he gets Congress to put through will be upheld by the court.

By the same token the substitution of another Alabaman for Black weakens the President's chances of getting as radical a legislative program as he would like from Congress. Had he not started the Supreme Court packing fight he would have had three vacancies to fill by this time instead of the one, and he would not have lost prestige by a spectacular legislative defeat.

Next session the conservatives, astonished at the measure of popular support they obtained, first in the court fight and then on wages and hours, will be much more active. They may be very regular on the surface, so far as party ties are concerned, but it is no longer too dangerous to fight the President on specific items.—CARTER FIELD, *Washington Bureau, McGraw-Hill Publishing Co.*

Reorganized Cord Group to Concentrate On Manufacturing

L. B. Manning, president and principal stockholder, Cord Corp. announced that the company proposed to liquidate its miscellaneous security investments and would concentrate attention in the future on the various operating units in which it holds substantial investments.

This announcement followed the first meeting of the new board of directors selected after the holdings of E. L. Cord were bought by Mr. Manning and his associates. No new name has been selected for the company.

The principal companies in which the Cord Corp. holds and expects to retain substantial investments are The Auburn Automobile Co., Aviation Corp., Checker Cab Mfg. Co., New York Shipbuilding Co., Columbia Axle Co. and Lycoming Mfg. Co.

With regard to future plans for automobile production Mr. Manning stated "If cars are produced in the future, it will not be in the present price range." His statement was interpreted to mean that Auburn would abandon the high-priced field, but would not necessarily enter the low-priced field, and that the name, goodwill, models, patterns and dies of the present Cord car probably were for sale.

Expansion in the general manufacturing of Auburn and other concerns is contemplated, particularly in the aircraft and automotive field, but also and to an increasing degree in the natural-gas-burning engine developed by Lycoming and in other industrial fields in which that company is interested.

Air Devices Corporation Moves General Offices

Directors of Air Devices Corp., manufacturer of plastic and other electrical products, have approved the transfer of general offices from Chicago to Meriden, Conn., and ratified the consolidation of the Connecticut Telephone & Electric Corp. with Air Devices. It was also decided to consolidate all future manufacturing activities at Meriden.

Vincent Bendix resigned as chairman and as a director, together with V. W. Kliesrath and George C. Fleener. H. P. Shearer, president, Connecticut Telephone & Electric, was made a director and vice-president of Air Devices, and C. A. Cuneen was elected treasurer and assistant secretary.

G. A. Schreiber, Consulting Automotive Engineer Dies

G. Adolph Schreiber, consulting engineer to the automotive industry, died August 16 of injuries received in an automobile accident. He was 56 years of age.

Mr. Schreiber came to this country 30 years ago from Germany where he had been employed in the Daimler Motor Works in charge of tool design and shop equipment. He served with several automotive companies in Detroit, among them the old E.M.F. Co., Paige Motor Co., Willys-Overland Works, White Motor Co., General Motors Truck Co.

Mr. Schreiber was one of the early members of the society of automotive engineers when the Detroit motor industry was in its infancy.

Will Enlarge Pipe Mill

A program to increase the Youngstown Sheet & Tube Co. seamless pipe-mill capacity approximately 60 per cent was announced by Frank Purnall, president. Changes are a "part of the management's aim to have 20 to 25 per cent greater diversified finishing capacity than steel capacity."

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Carrier Corporation, manufacturer of air-conditioning equipment, Newark, N. J., is planning modernization and improvement in the Franklin automobile plant purchased in Syracuse, N. Y., at an expected cost of $400,000, with equipment.

Eastern Tool & Stamping Co., Ballard St., Saugus, Mass., manufacturer of sheet metal stampings and dies, is planning a two-story addition to its plant at an expected cost of $50,000 with equipment.

Snap-In Tools, Inc., manufacturer of tool kits, Kenosha, Wis., has established a branch unit at Mt. Carmel, Ill. WM. ENDERS is general manager.

J. I. Case Co., Oakland, Calif., has contracted for a one-story plant addition. It is expected to cost over $50,000, with new equipment.

Locke Steel Chain Co., Bridgeport, Conn., has leased space in a plant at Crescent and Seaview Ave., for the production of power lawn mowers.

Industrial Review

• ALTHOUGH there are exceptions to the general rule, August vacations of machinery and machine tool buyers have resulted in a material slowing down in the placing of orders for this type of equipment. Most of the builders of machinery have welcomed the slackering of orders because it has enabled them to cut down on the overtime that was beginning to tire out key men in the factories. Since most of these manufacturers have backlogs of orders that carry them over into 1938 deliveries buyers who think that delay in placing orders will enable them to get better deliveries are fooling themselves.

• IN THE NEW ENGLAND territory the vacation season has resulted in a very definite letdown in activity during the latter part of August. Distributors in that territory look for a sharp upturn in September. New York also reports a slackering of orders but says there is good inquiry. August business in Philadelphia compared favorably with the July business but was still not in great volume. Heat, vacations and politics are held responsible. Local inquiries in Pittsburgh increased vigorously last week and indicate a fall volume well above that of the summer months. Hot weather in Cleveland has driven plant executives away on vacations and is thought to be responsible for slowness in placing of orders there.

• INVENTORY AND PLANT vacation periods are affecting equipment buying in Detroit. Supplies have been moving during the summer but that is about all. Activities in the independent Ford and Chrysler employee organizations are being watched. In Teledo business is better than usual at this season of the year. It is expected that this activity will continue and probably improve for the balance of the year. In Cincinnati business is holding up fairly well for this time of year. Further improvement is expected in the fall. In St. Louis, on the other hand, the first half of August was the dullest part of the year. Inquiry is good and orders are expected to break shortly.

• CHICAGO BUSINESS has held up suprisingly well all through the summer and distributing organizations there look forward to a very active fall and winter. Tractor and farm implement manufacturers are expanding and are calling for a considerable volume of machinery. Milwaukee business has also been maintaining a good level and there is no expectation of anything but improvement there. In the Pacific Northwest most machinery companies are working well above last year's levels.

Detroit LETTER

No breathing spell this year . . . Higher prices not expected to cut car sales in '38 . . . Graham reduces from four lines to two . . . Budd expands stamping division . . . Body becoming most expensive part of car as fenders and frames disappear.

DETROIT—This year the automotive industry will have little more than a short breathing spell between models. Buick, for example, assembled its last 1937 car on Aug. 13 and 10 days later the factory was in operation on 1938 products. Chevrolet will be building current models up into September, yet it expects to swing over onto next year's cars quickly enough to make 75,000 units during October. Plymouth is scheduled to be down only a week. This record changeover by the industry would not be possible, however, were it not for the fact that innovations for '38 are few.

Car Prices Still Higher?

Everybody looks for a good automotive year ahead. Even the prospect of a second price increase equal in some cases to the first one slapped on a few weeks ago does not dim Detroit's optimism. Though the total advance will equal 8 to 10 per cent of the delivered car price in factory cities, car makers hope to sell as many units in 1938 as this year.

Automatic transmissions continue to hold interest because they are the only new noteworthy mechanical development. The transmission now used by Oldsmobile at $80 extra will be available on the Buick 40, but not on the bigger Buicks. Studebaker and Nash will have the Evans automatic transmission. Pontiac and Cadillac-LaSalle are to feature a finger-shift control unit which will be optional equipment. It isn't the industry's intention to force the public to adopt automatic transmissions. It knows that any change in driving habits develops slowly. Hence most cars sold the coming year probably will still have conventional gear shifting. Buick anticipates that only about 15 per cent of its 40's will be sold with the new transmission unit.

The final step in automatic transmissions has not been taken. Chrysler has been working for several years on a unit of its own design which apparently is not yet perfected. One company is experimenting with a hydraulic transmission. Still another company has long been playing with an automatic unit of the planetary type which is reported to work beautifully but the cost of building it would be prohibitive.

Graham is to simplify its set-up by having only two lines of cars, both supercharged, instead of four the coming year. It will have the distinction of a complete new body designed by the famed Amos Northrup just before his death last winter. Pierce-Arrow, if it can complete new financing, intends to follow Packard into the medium-price car field with a line selling around $1,200. Packard the past model year has sold 65,400 sixes, 50,100 One Twenties and 7,100 de luxe jobs. Wheelbases of the six and One Twenty will be lengthened for '38.

The story is that Ford intends to try to fortify its position by offering more car for the money. A complete new set of body dies for the de luxe models indicates a new body for that line. The body now used on de luxe Fords is said to be scheduled for the standard Fords. There will be little change in the 60, which continues to garner about 40 per cent of the Ford sales total.

Edward G. Budd Mfg. Co. has spent over $400,000 the past week for large stamping presses for its Philadelphia plant. Budd is expanding its stamping division as its business with various automotive companies increases. It will furnish stamped parts to General Motors plants in the East and to Packard. Midland Steel Products will build frames for Buick's series 40 and 60 cars the coming year. A. O. Smith heretofore has had that business. Smith will supply frames to Chrysler's Evansville, Ind., and Los Angeles plants and will have a substantial share of the Dodge frame business. Murray has frame contracts for 1938 with Dodge Truck and with Ford.

Detroit hears that Ford is contemplating a major expansion of its body-building facilities at the Rouge plant. At present it turns out only a small percentage of its bodies. If that should occur, it probably would take much volume away from Briggs. Briggs, however, does a huge business with Chrysler. Moreover it is reported on the verge of announcing its entrance into the manufacture of many smaller car parts, particularly those made by Motor Products. If this program goes through, it will involve construction of a new plant and expenditure of millions. The merger of Briggs and Motor Products, the plants of which are next door to each other on Mack Avenue in Detroit, recently fell through. Thus Briggs is determined to make those parts which it otherwise would have secured from Motor Products.

Expensive Bodies

With the evolution in car design which is leading toward elimination of running boards, fenders and eventually frames, more and more of the cost of car building is centering in body production. The body is the part of the car which involves more productive man-hours than any other part (excluding assembly). With the growing importance of the body, car manufacturers like to have as much as possible of body manufacture concentrated in their own factories rather than done outside. This may have a bearing on Ford's apparent desire to gather into Rouge a larger share of the body making for V-eights.

Car manufacturers are watching closely the success of Willys with its small car. Price increases throughout the industry leave Willys in a good position for the coming year, even if it should raise its prices. A considerable share of the Willys business has come from people who heretofore have been used car buyers. If the Willys market continues to look "hot," it wouldn't surprise Detroit if one or more of the Big Three invaded it. Lately speculation in that regard has centered around Chrysler. Plymouth is known to have developed a small engine at the time that Ford was perfecting its 60-hp. V-eight motor.

Chrysler is moving in the direction of further manufacturing expansion. It has acquired a 13-acre tract adjoining its Highland Park property and a few days ago purchased the old Graham plant on West Fort Street in Detroit. It lately had rented this plant for parts storage; the corporation says that for the present the plant will continue to be used as a warehouse. This week court action is expected to clear the way for construction of a new Dodge Truck plant on Mound Road near Eight Mile Road in this city. The plant will be 400x1200 ft. in size.

Studebaker, Packard and Hupmobile are among the companies which will announce '38 models during September. Most companies, however, will wait until October. In most cases introduction dates haven't yet been set. If a plentiful supply of new models are put in dealers' hands sooner than expected, some car makers may advance the announcement date a week or two.

The United Automobile Workers are in the midst of their annual convention at Milwaukee, with two factions warring against each other. It appears that the conservative element in the union, headed by President Homer Martin, will be in the driver's seat the coming year. The U.A.W. in the 15 months prior to June 30 took over a million dollars into its international treasury. Over $900,000 of that amount came in since last Jan. 1. Conversations between the union and General Motors about changes in their contract have been adjourned until after the convention.

G.E. Raises Employees Wages According to New Wage Plan

The General Electric Company announced an increase in wages of 1 per cent for all employees in the company in accordance with its cost of living adjustment plan instituted in October, 1936. The plan provides for automatic increases in employee earnings, based on the progress of the cost of living index as published by the U. S. Department of Labor.

One per cent is added to the employees' earnings for each point of rise in the index up to 90. If the cost of living goes down, adjustments will be made until the index reaches 80. The plan further provides that if the company chooses the adjustment may take place at the halfway mark between each point. On that basis the employee earnings have increased 5 per cent although the present index stands at 84.5.

S.A.E. Aircraft Production Meeting to be Held in Los Angeles

The second annual National Aircraft Production meeting of the Society of Automotive Engineers is to be held in Los Angeles, October 7–9. The sixteen papers scheduled for the meeting will include discussions on factory equipment and tooling, production tools for airplanes, production problems in the manufacture of aluminum alloys, steel castings, magnesium castings, die-castings and molded plastics.

Tentative plans include a discussion on stainless steel in aircraft manufacture by a representative of the E. G. Budd Mfg. Co.

Auburn Buys "Aerofan" From Russell Electric

Auburn Automobile Co. has purchased the trade name "Aerofan" together with goodwill and exclusive patent licenses on fans formerly manufactured by Russell Electric Co., Chicago.

Announcement of the purchase came just prior to the first meeting of the new Cord Corp. board of directors following recent sale of his holdings by E. L. Cord.

L. B. Manning, former associate of Mr. Cord, is the new president of Cord Corporation.

Grumann Plans Expansion Program to Cost $1,000,000

Application to sell 100,000 shares of common stock has been made to the Securities and Exchange Commission by Grumman Aircraft Engineering Corp., Bethpage, Long Island.

The issue is expected to involve about $1,000,000 all of which will be spent for expansion, the company having recently received a contract for Navy planes. Annual sales of the company have been about $2,000,000 for the past three years with unfilled orders as of June of approximately $3,000,000.

General Electric Combines All Plastics Activities

The administration of all plastics activities of General Electric Co., has been consolidated at Pittsfield, Mass., and the company's construction materials sales division at Bridgeport relieved of the responsibility of plastics, it has been announced by C. E. Wilson, vice-president.

G. H. Shill is now manager of the plastics department with responsibility for all sales, engineering and manufacturing. Headquarters of the department will be at 1 Plastic Ave., Pittsfield. K. W. Nelson, who formerly was manager of automotive product sales, is sales manager of the new division.

Ludlum Steel Offers Speed Award and Trophy for Aircraft

Hiland G. Batcheller, president, Ludlum Steel Co., announced that the company was giving an award of $2,000 and a trophy for a new average speed record in the Thompson Trophy Race to be held in Cleveland as part of the National Air Races on September 6. If no new record is made the trophy and prize will be held over until such record is established.

Mr. Batcheller stated that the company had been active in aviation industry for many years, having furnished Silcrome valves for Lindbergh's Paris flight in 1927 and for Admiral Byrd's flight to the North Pole in 1926.

Record Attendance Expected At Annual Welding Meeting

C. A. McCune, chairman, American Welding Society Convention Committee, in a recent announcement stated that a record attendance is expected at the 18th annual meeting and exposition of the American Welding Society at Atlantic City, October 12–22.

Mr. McCune remarked, "More than 15,000 top executives, engineers, metallurgists, technicians and welding enthusiasts from all parts of this country and abroad will gather this year to hear specialists speak on the work going on in the research laboratories of the government, universities and industrial organizations. Papers dealing with the practical application of welding in the fabrication, railroad, ship building and other fields, and a welding symposium on alloy steels will draw large audiences."

The many developments which recently have appeared in the welding and cutting field are expected to attract considerable attention in the metal exposition.

June Exports of Agricultural Equipment Highest Since 1931

June exports of agricultural machinery worth $7,188,220 were 88 per cent higher than the exports for June of last year, and reached the highest peak since the early part of 1931. Exports for the first six months of 1937 show a steady increase, the total of $34,504,761 being an increase of 62 per cent over the corresponding period of last year, according to the Machinery Division of the Department of Commerce.

Seed separators, while not the largest in volume, showed a gain of 281 per cent over the shipments in June of last year, with a total amount of $327,347. This was due primarily to the shipment of 200 threshers as against 48 in the same month last year. Overseas consignments of implements of cultivation showed a gain of 123 per cent. Wheel tractors gained 108 per cent, with the total value of $1,815,959. The greatest advance in this class was in the sale of wheel tractors in the 15 to 32 belt horsepower size.

The largest single group in the agriculture machinery class was the tracklaying tractors which showed a gain of 86 per cent with a total sales of $2,038,582. As usual, the greater part of this increase occurred in the fuel injection type, in the 35 to 59 drawbar horsepower class.

Exports of harvesting machinery amounted to $501,799, a gain of 91 per cent over the sales of June 1936. The bulk of this increase was due to foreign sales of combines which advanced from 20 units to 91 units.

W.P.A. Finishes Report on 1936 Machinery Imports

The Works Progress Administration at Richmond, Va., under the direction of the United States Tariff Commission, has completed a tabulation of comparative import statistics for the calendar year 1936. These statistics were compiled from reports in code supplied by the Department of Commerce.

Volume III of this report contains statistics on imports of metals and manufactures, and machinery and vehicles into the United States for the past year.

Quantity purchased from each country and the total value of such purchases are presented in tabular form. In the machinery group are included all types of electrical machinery, including electric furnaces and ovens, calculating machinery, testing machinery and motors. Steam engines, diesel engines and gas engines are also tabulated.

Metal-working machine tools and parts have been grouped according to the various types. Textile and agricultural machinery are tabulated as well as office machinery, food machinery, mining machinery, sugar machinery and wood-working machinery.

Included in this portion of the volume are vehicles of all types including automobiles, trucks, aircraft, boats, bicycles and railway vehicles.

Swiss Machine Industry Settles Labor Problem

An agreement providing for the amicable settlement and arbitration of wage disputes in the Swiss machine industry has just been concluded between the association of Swiss machine and metal industries and the metal trade unions, according to a report received by the Department of Commerce from Consul General A. C. Frost, at Zurich, Switzerland.

In this agreement, which is operative for two years, both manufacturers and organized labor have voluntarily agreed to abstain from lockouts, strikes, and other combative measures during this period. For failure to observe this agreement the contracting parties may be forced to pay a fine.

Switzerland is the fifth largest exporter of machines in the world. This agreement was made at a time when increasing costs of living were adversely affecting production costs, and imperiling exports.

Exports of Machinery During June, 1937

	June, 1937	May, 1937	June, 1936
Electrical machinery and apparatus	$9,171,696	$10,372,561	$7,396,218
Power generating machinery (except automotive and electric)	1,067,787	1,119,050	654,773
Construction and conveying machinery	2,151,078	2,138,440	1,076,668
Mining, well and pumping machinery	4,574,390	5,429,705	2,530,851
Power driven, metal-working machinery	4,731,173	5,044,632	2,431,944
Other metal-working machinery	360,754	380,582	283,549
Textile machinery	937,884	738,091	641,710

Exports of Metal-Working Machinery During June, 1937

	June, 1937	May, 1937	June, 1936
Engine lathes	$232,191	$297,634	$135,983
Turret lathes	251,392	297,802	126,194
Other lathes	97,831	122,465	89,990
Vertical boring mills and chucking machines	319,097	195,843	92,364
Thread cutting and automatic screw machines	354,322	309,802	110,519
Knee and column type milling machines	226,220	325,522	68,220
Other milling machines	241,890	193,129	144,279
Gear cutting machines	287,123	234,843	49,170
Vertical drilling machines	83,850	65,994	74,071
Radial drilling machines	46,056	39,630	2,341
Other drilling machines	79,868	114,045	147,394
Planers and shapers	58,997	188,193	25,569
Surface grinding machines	79,478	130,466	63,128
External cylinrical grinding machines	112,385	238,488	90,434
Internal grinding machines	193,430	168,356	74,330
Tool grinding, cutter grinding and universal grinding machines	212,744	185,458	105,823
Other metal grinding machines	71,786	75,411	60,645
Sheet and plate metal grinding machines	282,901	284,933	194,704
Forging machinery	130,855	174,571	105,182
Rolling mill machinery	766,682	710,222	263,418
Foundry and moulding equipment	85,307	133,974	46,344
Other power-driven metal-working machinery and parts	516,768	557,851	361,842
Other Metal-Working Machinery			
Pneumatic portable tools	$116,762	$137,578	$96,607
Portable and hand and foot operated metal-working machines and parts	103,709	105,505	85,846
Chucks for machine tools	21,539	18,119	14,387
Milling cutters, machine operated threading dies and taps and similar machine-operated metal cutting tools	54,664	61,192	35,871
Other metal-working machine tools	64,080	58,188	50,838

Management Contest

The Society for the Advancement of Management has announced a contest on the subject, "Measured Day Work Versus Wage Incentives." Manuscripts must be in the office at 29 West 39th St., New York, by October 15. The $75 cash prize will be announced and presentation made at the annual dinner of the society, December 9.

PERSONALS

CLARENCE L. COLLENS, president, Reliance Electric & Engineering Co., Cleveland, has been elected to membership on the board of directors of the American Standards Association on nomination of the National Electric Manufacturers Association. He succeeds S. L. NICHOLSON, resigned.

Welding Consultant in England

CHARLES H. JENNINGS

CHARLES H. JENNINGS, engineer in charge of welding research, Westinghouse Electric & Mfg. Co., has gone to England to act as consulting welding engineer for the English Electric Co. He is expected to resume duties with Westinghouse about the first of December.

LESSITER C. MILBURN is now works manager of the St. Louis division of the Curtiss-Wright Corp. He has been, for many years, vice-president of the Glenn L. Martin Co., Baltimore, and holds numerous patents for airplane mechanical devices and design features.

P. H. GILPIN, formerly factory manager, Pratt & Whitney Aircraft Division, United Aircraft Corp., has joined the Eclipse Aviation Corp., East Orange, N. J.

H. W. TENNEY has been made engineering manager, New Products Division, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. GEORGE F. BEGOON has been made sales manager of the division.

T. M. GIRDLER, chairman, Republic Steel Corp., Cleveland, was made a director of the reorganized board of Cord Corp., New York.

L. T. KNAPP, formerly factory manager, Master Electric Co., Dayton, Ohio, has been made manager, Sterling Products Co., Indianapolis.

W. P. LOTZ will join William Sellers & Co. on September 1 as sales manager of the company's Standard Machine Tool Division.

GAIL E. SPAIN, formerly assistant sales manager, Caterpillar Tractor Co., has been appointed general manager, Rock Handling Division, Sullivan Machinery Co., Claremont, N. H.

With Sullivan Machinery

GAIL E. SPAIN

Mr. Spain will be in charge of domestic sales offices handling portable air compressors, industrial hoists, and in addition, will be responsible for manufacturing and engineering operations of the Rock Handling Division.

H. L. PIERSON, president, Detroit Harvester Co. and a member of the board of directors of Eaton Mfg. Company, has been elected chairman of the board of Eaton-Erb Foundry Co., Detroit. JOSEPH L. DOSTAL, formerly vice-president in charge of engineering and research, has been made president. EDWARD C. HOENICKE, formerly sales manager, has been elected vice-president and a director.

WILLIAM REA FURLONG, Captain, U. S. Navy, has been made Chief of the Bureau of Ordinance, Navy Department, with the accompanying rank of Rear Admiral. He will relieve HAROLD R. STARK, Rear Admiral U. S. Navy, on August 26. Rear Admiral Stark has been ordered to duty as Commander Cruiser Division 3, Battle Force, Flagship USS Concord.

M. I. DORFAN, former manager of the Blaw-Knox Company, is now general field representative for the Pangborn Corp., Hagerstown, Md.

BUSINESS ITEMS

National Tool Co., Cleveland, has opened a sales office in Chicago, at 9 South Clinton St. S. J. BURDICK is sales manager. The Detroit Office has been moved to 417 Stromfeltz-Lovely Building. H. G. ALLEN has been added to the sales staff.

The Mather Spring Co., manufacturer of motor car springs since 1911, will erect a $500,000 plant at Linden, N. J. This plant is to serve the General Motors Linden plant as well as Ford and General Motors plants at Tarrytown, Edgewater, Atlanta and Baltimore. The plant which is expected to be completed by next March will employ about 300 men and have an area of 90,000 sq. ft. There will be no curtailment of work in the Toledo plant according to GORDON M. MATHER, president.

Pierce-Arrow Motor Corp. is to raise approximately $11,000,000 of new capital with which to launch production and sales changes for its automobiles and trailers. A. J. CHANTER, president, indicated that the Company is contemplating a low-priced car, in addition to its higher priced line.

Lawrence Engineering & Mfg. Co., 1863 Union Guardian Bldg., Detroit, has been incorporated for the manufacture of automobile products. R. B. LAWRENCE is the president.

Link-Belt Co., has let a contract for a one story addition to their Atlanta, Ga. plant to cost about $65,000 with equipment.

Buffalo Pressed Steel Co., manufacturer of exhaust mufflers for automobiles and motor trucks, and other automotive steel products, Buffalo, has acquired property in Youngstown for a new plant to cost about $100,000 with equipment.

Chain Belt Co., manufacturer of chain, sprockets and conveyors, Milwaukee, has completed a building at its West Milwaukee works to house all machine operations except manufacture and assembly of chains and finishing of sprocket wheels.

Swift Tool & Stamping Co., Toledo, Ohio, has acquired Building No. 38 of the Willys-Overland plant.

The Eagle Belt Lacer Co., Stratford, Conn., has moved into its new factory at 1261 Stratford Ave.

The High Speed Hammer Co., Inc., manufacturer of high-speed riveting hammers, precision drills and the Bruno slotting attachment for shapers, Rochester, N. Y. has appointed RAYMOND H. DAUTERICH, 1205 East 25th St., Baltimore, Md., as representative in Maryland, Delaware, Washington, D. C., and middle Pennsylvania up to and including Harrisburg.

The Mathews Conveyor Co. announces the opening of their Detroit sales engineering office at Room 319, Curtis Building, 2844 West Grand Boulevard.

OBITUARIES

Thomas F. Maher, President Chapman Valve Company, Dies

Thomas F. Maher, for the past six years president, Chapman Valve Mfg. Co., Indian Orchard, Mass., died in a Rhode Island hospital on July 29, as the result of a cerebral hemorrhage. He was 52 years old.

Mr. Maher was one of the country's authorities on the development of valves to meet high temperature and high pressure requirements, both in industrial and public utility applications.

Albert W. Wenzel Was Head of U. S. Hammered Piston Ring

Albert W. Wenzel, president, U. S. Hammered Piston Ring Co., Baltimore, Md., died August 11. He was 57. Mr. Wenzel developed certain fundamental principles in piston rings and held patents on equipment used by aircraft motor manufacturers. He founded the American Hammered Piston Ring Company in Newark, in 1911, and in 1917 sold it to a syndicate which moved the plant to Baltimore. In the same year he formed the firm which he headed at his death.

Born in Hungary, he came to this country in 1903. He first worked as a metal worker and in his spare time devised improvements in piston-ring design. He directed the manufacture of the rings for the motor of Lindbergh's Spirit of St. Louis, Admiral Byrd's polar planes and the planes of the Russians who recently made the North Pole crossing to this country.

Jordan Korp, Well Known in Heat-Treating Industry, Dies

Jordan Korp, of the Leeds & Northrup Co., died of a heart attack at his home in Philadelphia, August 10. He was 64 years old.

Mr. Korp was born in Norway and in 1904 was sent to this country for a post-graduate course as a toolmaker and to secure ideas for the further development of the tool and machine industry in Norway. He returned to this country in 1905 and took a position as toolmaker with the Leeds & Northrup Co., later becoming foreman of the toolroom.

He contributed much to the development of improved methods of hardening, particularly to the Hump

L & N Heat-Treating Expert

JORDAN KORP

method, and took charge of service work in the field when this method became widely known and used.

GEORGE ROBERT BOTT, chief engineer and a director, Norma-Hoffman Bearings Corp., Stamford, Conn., died August 14 at the age of 58. Mr. Bott joined the Norma-Hoffman organization about 25 years ago and was one of the pioneers in the bearing industry. He held numerous patents on anti-friction bearings and other mechanical devices.

CHARLES H. KIRBY, formerly vice-president in charge of engineering, Marvel Carburetor Co., died recently at the age of 50. Mr. Kirby had resigned from the company in 1934, to organize the Industrial Engineering Co., Flint, Mich.

WILLIAM A. JOHNSTON, professor emeritus of theoretical and applied mechanics, Massachusetts Institute of Technology, died August 6, at the age of 68. Professor Johnston had been associated with the school since 1892. With C. E. FULLER, he wrote "Applied Mechanics," "Statics and Kinetics" and "Strength of Materials."

JOSEPH P. MONTGOMERY, JR., was elected vice-president in charge of sales, Empire Sheet & Tin Plate Co., according to an announcement by J. M. HILL, president.

JOHN H. SMITH, president and treasurer, American Steel Engineering Co., Philadelphia, died July 25. Mr. Smith had formed the company in 1919 and in 1929 built the present fabricating plant.

JAMES B. WATSON, former president, United Supply & Mfg. Co., a railway supply company, Chicago, died August 5 at the age of 70.

JOSEPH C. HALBLEIB, automotive pioneer, died in Rochester, August 16. He was 58 years old. Mr. Halbleib was sales manager of the Delco Appliance Corp., formerly the North East Electric Co., which he founded with his brother, and of which he was director until its purchase by the General Motors Corp. in 1929. The two brothers developed the electric starter-generator manufactured by the company. He was also active in the founding of the Electromatic Typewriter Co., now a division of the International Business Machines Corp.

C. C. MCCONVILLE, superintendent, Clintonville factory, Four-Wheel Drive Auto Co., died August 10, at the age of 63. In 1900, Mr. McConville became superintendent of factories for the Emerson Brandiham Co. Later he became superintendent of the Big Four Tractor Co., Minneapolis. He had been superintendent at Clintonville, since 1916.

GEORGE W. FOWLER, manager, Chicago office, New Departure Division, General Motors Corp., Bristol, Conn., died August 9 at the age of 61. Mr. Fowler had been with the company since 1917, having founded the sales and engineering office at Chicago.

EXPORT OPPORTUNITIES

The Mortimer Engineering Co., importers of machine and small tools, Acton Lane, Harlesden, London, N. W. 10, England, wish to make direct contact with American firms which do not have representation in England. The company desires catalogs, price lists and discounts and is particularly interested at the moment in surface grinders (2 in.), medium weight lathes with step cone drive and 12 to 14 in. swing, geared or cone driven milling machines with automatic table feed (table size, 30 x 8 in. and upward). Machines will be carried in stock in England but all prices should be quoted F. O. B. New York. Payment will be made through Guiterman Co., Inc., 35 So. William St., New York, associate of the Mortimer company, and a copy of any correspondence should be sent to them.

Bernard Katz, 110 West 40th St., New York, requests information for clients in South America who are interested in complete equipment for the manufacture of ivory buttons capable of producing 60,000 buttons in ten hours. Included must be sawing machinery, turning machinery,

automatic perforating machinery, polishing machinery, belting, and an air-drying stove.

Photograph corners, labels, and pattern cards manufacturing machines. (Purchase). Karachi, India. *3804.

Waterworks equipment and filters. (Agency) Tours, France. *3803.

* Interested American firms and individuals may obtain the names and addresses of the foreign firms making these inquiries upon application to the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, Washington, or any district or cooperative office. Please refer to key number.

Scovill Buys Vulcanite

Scovill Mfg. Co., manufacturer of metal products, brass and wire goods, Waterbury, Conn., has purchased the plant and business of Vulcanite Mfg. Co., manufacturer of snap fasteners and kindred products, Lindenhurst, N. Y. This plant will be discontinued and it is expected that part of the machinery will be transferred to the plant of the Oakville division of Scovill at Waterbury, where production will be increased.

MEETINGS

AMERICAN FOUNDRYMEN'S ASSOCIATION. Midyear meeting. Columbus, Ohio. Sept. 30–Oct. 1.

AMERICAN GEAR MANUFACTURERS ASSOCIATION. Twentieth semi-anual meeting. Spink-Wawasee Hotel, Lake Wawasee, Indiana. Sept. 20–22. J. C. MCQUISTON, secretary, Penn Lincoln Hotel, Wilkinsburg, Pa.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, Pacific Coast convention. Spokane, Wash., August 31–September 3. H. H. HENLINE, secretary, 33 West 39th St., New York.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS. Iron and Steel Division. Atlantic City, N. J., Oct 18–22.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Welding Committee and Machine Shop Practice Division. Atlantic City, N. J., Oct. 18–22.

AMERICAN SOCIETY FOR METALS. National Metal Congress and Exposition. Atlantic City, N. J., Oct. 18–22. W. H. EISENMAN, secretary, 7016 Euclid Ave., Cleveland.

AMERICAN WELDING SOCIETY. Annual meeting. Hotel Traymore, Atlantic City, N. J., Oct. 18–22. WARREN S. HAYS, managing director, 39 W. 39th St., New York.

ASSOCIATION OF IRON & STEEL ENGINEERS. Annual meeting combined with Iron & Steel Exposition, Stevens Hotel, Chicago. Sept. 28–Oct. 1.

CHICAGO EXPOSITION OF POWER AND MECHANICAL ENGINEERING. New International Amphitheatre, Chicago. October 4–9. CHARLES F. ROTH, vice-president, International Exposition Co., Grand Central Palace, New York.

INDUSTRIAL RELATIONS CONFERENCE. Twentieth annual meeting. Silver Bay-on-Lake George, N. Y., August 25–28. J. M. GROVES, executive secretary, 347 Madison Ave., New York.

MASTER BOILER MAKERS ASSOCIATION. Annual meeting, Hotel Sherman, Chicago. Sept. 29–30. A. F. STIGELMEIER, secretary, 29 Parkwood St., Albany, N. Y.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION. Annual meeting. Chicago. Oct. 24–29. W. J. DONALD, managing director, 155 E. 44 St., New York.

NATIONAL SAFETY COUNCIL. Annual meeting. Kansas City, Mo. Oct. 11–15. W. H. CAMERON, secretary, 20 N. Wacker Drive, Chicago.

NATIONAL TRAILER SHOW. First annual exhibit. 71st Armory, New York City, September 10-15. LEE J. LEONARD, 250 West 57th St., New York.

PORCELAIN ENAMEL INSTITUTE. Seventh annual meeting, Chicago, Ill. October 11-12.

PORCELAIN ENAMEL INSTITUTE. Second forum. Ohio State University, Columbus, Ohio. October 13-15.

SOCIETY OF AUTOMOTIVE ENGINEERS. National aircraft production meeting. Los Angeles, Cal., Oct. 7–9.

PATENTS

August 10, 1937

Metal-Working Machinery

Bearing Blank Bending Machine. William P. Anderson, Flint, Mich., assigned to General Motors Corp., Detroit. Patent 2,089,169.

Tandem Mill. Irving H. Tolles, Waterbury, Conn., assigned to The Waterbury Farrel Foundry & Machine Co., Waterbury. Patent 2,089,311.

Broaching Machine. Francis J. Lapointe, Ann Arbor, Mich. Patent 2,089,753.

Machine Tool (Planer Type Milling Machine). William F. Ridgway, Rockford, Ill., assigned to The Ingersoll Milling Machine Co., Rockford. Patent 2,089,814.

Welding Machine. Harry E. Rockefeller, New York, assigned to Union Carbide & Carbon Corp., New York. Patent 2,089,840.

Parts and Mechanisms

Welding. Edwin F. Labadie, Detroit, assigned to General Motors Corp., Detroit. Patent 2,089,213.

Combination Drilling and Tapping Control. Lawrence L. Schauer, Wyoming, and John H. McKewen, Cincinnati, assigned to The Cincinnati Bickford Tool Co., Cincinnati. Patent 2,089,228.

Tool Holder for Lathes. Henry C. Pierle, Cincinnati, assigned to The R. K. LeBlond Machine Tool Co., Cincinnati. Patent 2,089,421.

Electrode Holder. Roger W. Clark, Scotia, N. Y., assigned to General Electric Co., New York. Patent 2,089,688.

Method of Mounting Cooperating Tools. Hugh M. Hodge, Detroit, assigned to George A. Vis, Detroit. Patent 2,089,795.

Machine Tool Spindle Construction. Raymond A. Carlson, Rockford, Ill. Patent 2,089,930.

Processes

Method of and Apparatus for Treating Metal Surfaces. Robert H. Gordon, Detroit, assigned to Parker Rust Proof Co., Michigan. Patent 2,089,648.

Tools and Accessories

Wrench. Stephen Uvaney, Cold Spring, N. Y. Patent 2,089,589.

August 3, 1937

Metal-Working Machinery

Internal Grinder. Harold E. Balsinger, Edgar P. Wine, and Daniel Gurney, Waynesboro, Pa., assigned to Landis Tool Co., Waynesboro. Patent 2,088,682.

Cutting Machine. Arthur J. Fausek and Irwing F. Fausek, Clayton, Mo. Patent 2,088,695.

Metal Bending Machine. William E. Kane, Syracuse, N. Y. Patent 2,088,746.

Riveting Machine. Louis C. Huck, Grosse Pointe Village, Mich., assigned to Huxon Corp., Michigan. Patent 2,088,859.

Grinding Machine and Method of Grinding. Ingle R. Shue, Beloit, Wis., assigned to Gardner Machine Co., South Beloit, Ill. Patent 2,089,040.

Apparatus for Cleaning or Degreasing Materials. Joseph Savage, Weston Point, Runcorn, England, assigned to Imperial Chemical Industries, Ltd., Great Britain. Patent 2,089,102.

Apparatus for Sizing and Flanging Sheet Metal Articles. William Irven, Lakewood, Ohio, assigned to The Standard Oil Co., Cleveland. Patent 2,089,119.

Parts and Mechanisms

Index Mechanism. Leonard O. Carlsen, Rochester, N. Y., assigned to Gleason Works, Rochester. Patent 2,088,687.

Electrode. Edmund J. von Henke, Chicago, assigned to American Electric Fusion Corp., Chicago. Patent 2,088,936.

Saw Tooth. Ralph N. S. Merritt, Worcester, Mass., assigned to Norton Co., Worcester. Patent 2,088,998.

Control Mechanism for Grinding Machines. Peter Plantinga, Amherst, Mass., assigned to Greenfield Tap & Die Corp., Greenfield, Mass. Patent 2,089,002.

Welding Tool. Edward G. Beiderman, Detroit, assigned to General Motors Corp., Detroit. Patent 2,089,013.

Method and Apparatus for Welding and Cutting. James H. Bucknam and Lloyd W. Young, Buffalo, N. Y., assigned to Union Carbide & Carbon Corp., New York. Patent 2,089,014.

Control System for Welding and Cutting Machines. James H. Bucknam, Cranford, and Lloyd W. Young, Scotch Plains, N. J., assigned to Union Carbide & Carbon Corp., New York. Patent 2,089,015.

Control System for Welding and Like Operations. Homer W. Jones, Westfield, N. J., assigned to Union Carbide & Carbon Corp., New York. Patent 2,089,029.

Taper Attachment for Lathes. Frank Tyson, Highland Park, Mich. Patent 2,089,078.

Tool Holder. Hugo O. Reichhardt, Highland Park, Mich. Patent 2,089,166.

Processes

Electrodeposition of Chromium. Max Schlotter, Berlin, Germany. Patent 2,088,615.

Method for the Production of Bodies of Extreme Hardness. Anton Kratky, Vienna, Austria. Patent 2,089,030.

Welding. Ernest M. Sims, Elkhart, Ind. Patent 2,089,103.

Tools and Accessories

Composite Tool. Felix C. Hartung, Chicago. Patent 2,089,121.

Device for Testing Gears. Alfred B. Kleinmann, Cincinnati. Patent 2,089,134.

Little Profit in Building Special Tools

O. W. WINTER

ONE DOES NOT have to look far to see the difference between the apparent profit margin in building special tools and machines and that in building standard products, especially where the existence of patents makes possible a greater margin of profit. A young man had better engage in any other field if he wishes to obtain a sizeable return on his investment in study and training. This is not at all a healthy thing for the industry and I feel that it in no small measure contributes to the present shortage of skilled labor. A man can simply earn more money in other fields with a smaller investment in years of training, skill and tools required.

I have long felt that one of the greatest handicaps to the establishment of the metal-working industry on a generally profitable basis is the small shop in which the methods of accounting and pricing are catastrophic to itself as well as to the industry. Such shops come and go, and the worst thing that can happen is for them to be successful in getting a considerable amount of business. Such a condition really speeds up the reaction that results from incorrect accounting and pricing.

I do not mean to infer that competition is undesirable nor that the survival of the fittest is not a good thing. In the absence of intelligence on the part of the small-shop proprietor, buyers of tools and equipment might well heed the hand-writing on the wall, that with labor agitation at its present pitch it will not be long before unskilled labor on the production line will be paid more than skilled mechanics. The obvious result will be that wages of skilled mechanics will have to be increased, and that with the increase will come an increase in the prices of special tools and equipment. Let us hope that when the increase does come it will be sufficient not only to make up the increase in wages but will also attain a better balance in relation to other industrial projects.

A goodly number of the larger buyers of special tools and equipment individually and collectively are as much of a destructive force to the industry as is the small shop. It is not uncommon for a general understanding to exist among certain makers of special tools and machines that orders from some particular concerns usually result from mistakes in their quotations that made them the lowest bidders. Hammering down the price by pitting one poor beggar against another is bound to backfire.

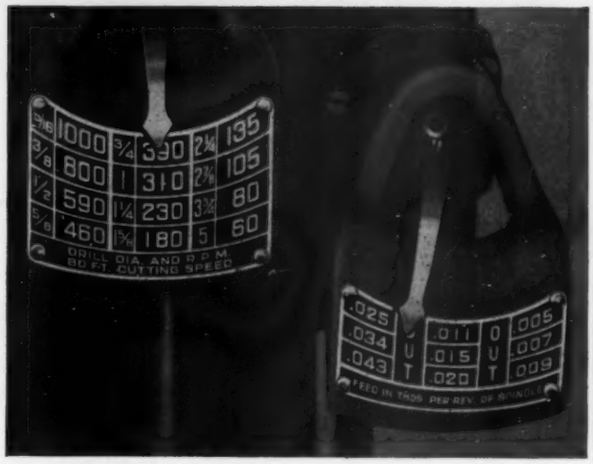
It is unfortunate that builders of special tools and machines do not seem to be able to come to an understanding in such matters. What is needed is a strong hand to guide them out of the wilderness, to make them realize the seriousness of the situation enough to organize something comparable to the National Machine Tool Builders Association.

Pitch Diameter Control of Galvanized Bolts and Nuts

H. W. BEARCE, author of the article on this subject which appeared recently (*AM*—Vol. 81, page 656), has called our attention to an error in the chart as reproduced. In the lower half of the chart the designation opposite 0.4478 on the scale should be "Class 1 maximum" instead of "Class 1 minimum."

All geared 21" 24" and 28"
SUPER SERVICE UPRIGHTS

featuring
DIRECT READING SPEED and FEED PLATES



● A wide range of useful speeds and feeds are instantly available on Super Service Upright Drills with convenient single lever control.

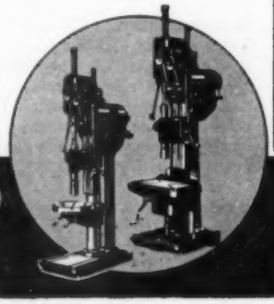
The speed plate at the left shows at a glance the 12 spindle speeds provided progressively from 60 to 1000 r.p.m. on the 24" and 28" machines. On the 21" machine, 9 speeds are available.

● At the right is shown the feed plate which on the 24" and 28" machines provides 9 rates of feed from .005" to .043" per revolution. On the 21" machine 4 rates of feed are provided.

By providing quick easy selection of feed, closely graded in range, fine feeds are available for small drills, coarse feeds for large drills and fast feeds for reaming. Every tool used can be operated to the economical limit of its endurance.

Other features that make for long life and efficiency include: ball and roller bearings, heat treated alloy steel gearing, positive type feed clutch, automatic depth gauge and table arm controls at front of machine.

Write for Bulletin U-22.



THE CINCINNATI BICKFORD TOOL COMPANY
OAKLEY - CINCINNATI - OHIO - U. S. A.

Hiring Older Men

J. HOMEWOOD

I AGREE FULLY with Roger C. Dickey, who has discussed this subject in the article "After 50—What Then?" (*AM*—Vol. 81, page 637). We frequently read or hear about the scarcity of skilled mechanics—especially those in the field of all-around machinists.

At a recent meeting, there was announced a need for first-class machinists who had wide experience, were highly skilled and who were not more than 43 years of age. How that age was arrived at is beyond me.

At 43, the all-around machinist is at the beginning of his period of usefulness, wherein he can apply his hard-earned experience and skill to new undertakings. One cannot acquire skill overnight; it must come with experience.

It is a dark situation in which the older and more reliable men are forced to stand by and discourage younger men from acquiring training as machinists. The idea that men at the age of 43 are too old to hire parallels somewhat the foolish conception of the judicial value of a Supreme Court Justice who is more than 70 years old. The judge acquires wisdom with age, the machinist accumulates experience and develops skill with age. A judge at 70 is a young man on the bench; a machinist at 43 is also a young man whose services should be sought by those who want value for their money.

The invaluable mechanic is he who has been through the mill of experience, who is capable of mastering difficult situations and who is not easily affected by grumblers.

Cutting Costs with Duplicate Dies

Duplicate and multiple cavity dies can be used much oftener to reduce molding costs and speed up production with Gorton Duplicators in the die department.

Gorton Duplicators are replacing ordinary machine tools wherever die duplication is a factor in production. They have cut in half or better both cost and time of reproducing dies.

Send for our Duplicator Booklet 1319B showing numerous examples of dies and molds reproduced for plastic, glass, or rubber molds, die castings, forgings, etc.

Example No. 1311 — Clipper head dies of KLS oil hardening tool steel for molding Bakelite clipper head above. Forming cavities reproduced on Gorton Duplicator from Bakelite models in 12 hours. Other operations done on ordinary milling machine.

GEORGE GORTON MACHINE CO.
1103 13TH ST., RACINE, WIS.

Kinks Did It—Why?

LAURENCE F. SOUTHWICK

SEVERAL ARTICLES under the above title have already appeared in these pages, whence it appears that (1) arbors have a way of sticking in milling machine spindles, and (2) reader interest in the subject is inexhaustible, but my interest is not, hence I take the liberty of appointing myself a committee of one to edit, recapitulate and finalize the whole matter—if possible.

George J. Murdock's original article (*AM*—Vol. 80, page 893) made clear that battering with a piece of cold-rolled shafting failed to budge the arbor. What weight shafting and how long was the battering continued? Then a workman kinked a brass rod several times so that a slight amount of springiness would be produced. Tapping this rod with a light hammer released the arbor after twenty minutes—a longish time.

But not until Mr. Murdock's last article appeared (Vol. 81, page 414) was it learned that an attempt had been made to remove the arbor by tightening the nut provided for that purpose up against the spindle nose. But the arbor still stuck. Then (tut, tut, Mr. Murdock) the nut, presumably at the end of its rope with hand effort, was further tightened by whacking the wrench with a soft hammer. The arbor still stuck; the noble threads still held. Not until someone thought of jamming the wrench against the table and letting the spindle revolve through the back gears did the boys succeed in stripping the threads.

Actually, both Robert S. Alexander (Vol. 80, page 1088) and R. B. Willis (Vol. 81, page 16) gave the answer

to the stuck-arbor problem, though they failed to set forth the principle involved, that pressure plus tapping are ten times as efficient as either alone.

With Mr. Murdock, I cannot think it prudent to apply the pressure by means of the machine's cross-feed screw, as advocated by Mr. Alexander, unless it is made clear that the steel strips are long enough so that the lever they constitute is very short between the frame of the machine above the arbor shoulder and very long from the arbor shoulder to the table. In other words they should be long enough to be bent by the operation of the cross-feed screw without damage to it or the nut. The pressure thus produced would be enough to loosen the arbor when it was struck from behind. Herbert M. Darling (Vol. 80, page 1952) and Mr. Willis both bring about the actual extraction of the arbor when it is struck from behind.

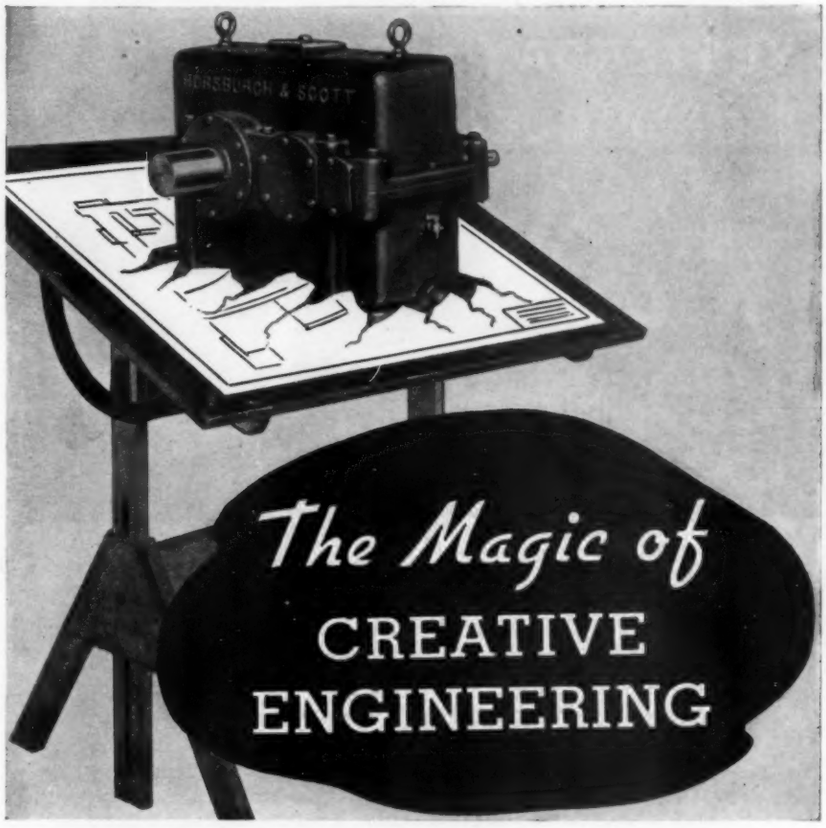
Now to get back to the kinked rod and to Mr. Murdock's original article. First, tapping alone with the cold-rolled shafting was tried. That accomplished something, though it was imperceptible. Then pressure alone was tried, and the threads were stripped. Then tapping was tried again, this time by hammering on the kinked brass rod, and in twenty minutes out jumped the arbor.

What did the kinks do? Nothing whatever. After all the effort that had been put on the arbor, twenty minutes of tapping with almost anything would have loosened it. The kinks actually reduced the effectiveness of the blows by introducing springiness into the bar. Mr. Murdock states that the workman allowed the bar to bounce. That bounce represented work done on the bar that did not go into budging the arbor. Did you ever notice how, in playing pool, when the pocket ball has been hit fair and square by the cue ball, the cue ball stops dead and the pocket ball goes right along as though it had been struck directly by the cue? All the energy of the cue ball, less that converted into heat by impact losses, has been transferred to the pocket ball.

There isn't any hocus pocus about friction. In the case of the stuck arbor, tremendously high static friction had to be overcome. So high, in fact, that hammering below the danger point was not sufficient to loosen the arbor because the adhesion was so great that the energy of the blows served only to deflect the metal parts within their elastic limit. When the instant of impact was past they sprang back to where they were before, or damage would have been done. But if some strain had been put on those parts, thereby using up some of their deflection, and they had then been given a sock, the elastically displaced metal parts could not all return to where they were. Some would be held where the blow landed them because of the initial strain, and that means partial or complete loosening.

The arbor would have come out in a very few minutes if (1) the nut had been tightened wrench-tight by hand, not by hammer, and (2) if the arbor had been tapped from behind with an *unkinked* brass rod or with anything else that was capable of delivering a blow of moderate intensity. But perhaps it's unsportsmanlike to make that statement so categorically. Anyhow, the arbor is out and there is no way of proving me wrong.

No story on the general topic of get-



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ting two stuck members apart will be complete without mention and commendation of the method suggested by N. V. Smith (*AM*—Vol. 81, page 580). It has a certain drawback in requiring a pipe thread to be tapped in the rear end of the spindle—an operation that in some instances may be undesirable or, in the case of a heat-treated spindle, difficult. These objections are, however, minor.

There is one caution that Mr. Smith might have added. Before screwing in the pipe fitting, fill the spindle behind the arbor with the same kind of grease that is to be used in forcing out the arbor. In other words, get out the air, otherwise the milling machine will be converted into a piece of field artillery.

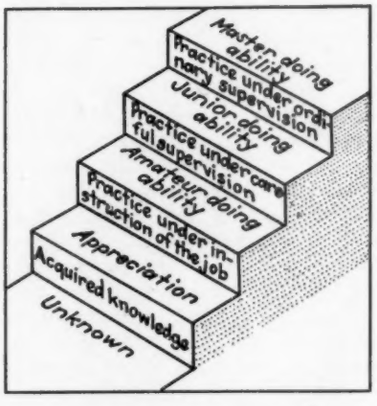
British Bicycle Boom

ACCORDING to an official of the Hercules Cycle Company, quoted in *Industrial Britain*, more bicycles have left the city of Birmingham recently for overseas countries, both inside and outside the Empire, than ever before in its history. In addition, the B.S.A. Company announces an increase of 51 per cent in the export of bicycles as compared with the same period last year, while the export of motorcycles has increased by 17 per cent during the same period.

During the past few months, this company has supplied the South African police with 200 motorcycles and side-cars; the Egyptian government has ordered 150 motorcycles, and 125 machines have been sent to Batavia for the use of the police there. Other recent motorcycle orders received by this firm include machines for postmen in Bagdad and Damascus, the army in Southern Rhodesia, for traffic police in the Dutch East Indies and for goldfield inspectors in Western Australia.

Training and Steps in Job Holding

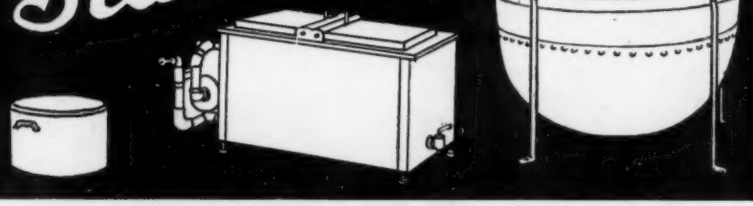
THE ACCOMPANYING illustration presents the necessary steps which the untrained youth must take to finally become a skilled workman. Beginning with the state in which he is in complete ignorance of any trade and of the advantages of an acquired skill, he may, through proper education, acquire sufficient knowledge to have



an appreciation of the trade which additional education and practice can give him. It is this first step of knowledge that causes the young man to visualize the broad field which additional mechanical training will allow him to enter as a worker not only with his hands but also with his mind.

Having reached this period of appreciation he may take the next step of practice under instruction. It is during this time that careful instruction on every portion of the job must

YESTERDAY'S BEST WON'T CLEAN Stainless Steel



LIKE so many other of the newer metals and alloys, stainless steel requires cleaning materials and methods specially prepared for the purpose. Old-time cleaning products of yesterday are not good enough. They just won't work out right.

Whether you manufacture stainless steel streamlined trains, kitchen cabinets or table tops, you'll like the speed and economy of Oakite cleaning for removing dirt, processing oils and compounds before assembly. And . . . don't neglect that final cleaning before shipment . . . removal of all shop dirt, fingermarks and oil spots that can so easily mar the lustrous appearance of your product. Wiping down with the recommended Oakite material does a thorough job. Leaves no streaks or scratches.

If you have a cleaning problem of any kind, write for specific, helpful information we can offer you. No obligation.

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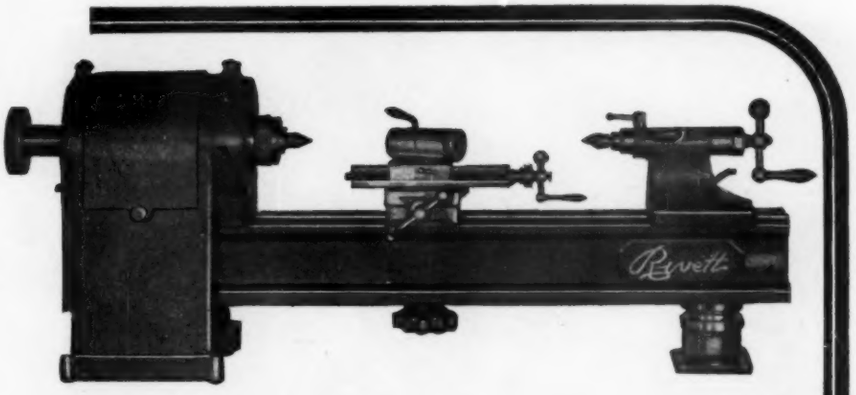
be given and the fundamentals of the trade must be taught. Upon proper accomplishment of this work the young man is considered to have acquired "amateur doing" ability. Being past the stage where instruction on every item is required, the worker begins actual practice under careful supervision. The practice gained strengthens his knowledge of the fundamentals of his job and he advances to the step of "junior doing" ability. He now has fair skill in the working of his trade and is of such ability that he continues under only ordinary supervision and intermittent instruction. His advancement depends on his own ingenuity, ability and skill to bring his previous instruction and training to bear on every new problem. If he can do this successfully, he has made the final step of the skilled craftsman who possesses "master doing" ability.

In the past few years many companies have failed to continue their training courses. At the same time, there are many small companies who could not at any time afford to support a training course of their own. For that reason there is now existing a shortage of skilled labor of even "junior doing" ability. Yet there are millions of intelligent people out of work. This combination of circumstances leads one to believe that a different system of training should be adopted generally throughout the country. The youth of the country ought to be better and more usefully trained for the various industries requiring skilled labor.

H. W. Teichroew, of the Department of Education of St. Paul, Minn., reports that 92 per cent of the trade school graduates of St. Paul of the class of 1933 were employed within one year after graduation. More than 73 per cent were employed at the trade for which they had been trained, and only about 7 per cent were unaccounted for one year later. As an indication of the value of such training, one might consider the facts concerning high school graduates in cities of the first class in Minnesota during the same time. Within one year after graduation from high school, 41 per cent were found to be continuing their education, 31 per cent were employed, over 17 per cent were unemployed and 9 per cent were unaccounted for.

It is also a fact that since 1933 there was never a time when capable trade trained boys of good personality were without employment. At the same time, since 1933, the mechanical trades on the whole have been unable to secure a sufficient number of high type young men to enter as apprentices. This has been borne out by the data previously reported (*AM*—Vol. 81, page 280-281). In this report it was found that while 80 per cent of the companies had some form or other of apprentice training there were still six jobs for every five men available.

It may be concluded, therefore, that both the employers' associations and the crafts unions as well as industrial education need to approach a better understanding of the aid that can be given by public schools in the preparation of youth for living. It would seem that the use of public schools as trade schools might serve several purposes. In the present day when child labor laws seem to be considered more and more seriously and the minimum age at which young people can work is raised higher and higher, it becomes necessary to fill the interim with some suitable and valuable method of training. Many



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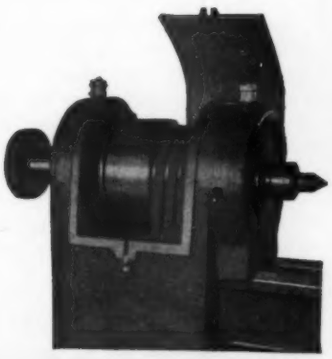
Ball Bearing and Roller Bearing Spindles

COMPARE your present lathe equipments for small parts with modern Rivett Ball Bearing and Roller Bearing spindle units. Increased production is made possible by efficient drives for all purposes . . . quick start and stop . . . full power in both fast and slow range . . . higher maximum spindle speeds . . . greater operating convenience . . . sturdier construction . . . maintained precision. Improve quality and lower costs by using Rivett Anti-Friction Bench Lathes in replacement of inadequate, slow or clumsy old-fashioned tools.



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Dynamic Balance

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young men do not desire a general education, and would prefer some practical training. Some sort of public school system where this can be carried out would, for the same outlay of money, provide a group of trained, skilled workmen who could take their place in the community upon release from school, which is not the case when taking a general school course. At the same time, not only the small manufacturer but also the large manufacturer would secure semi-skilled and properly trained workmen at less cost to themselves. In this way all industry would have a reliable source of plant personnel.

Mere theorizing, however, is not enough; action of some sort is required, and the immediate problem confronting industrial education and industry seems to be: how can we urge that large number of boys who could profit by it, to see and prepare for the obvious opportunities awaiting them in the skilled trades?

When the Time Is Ripe

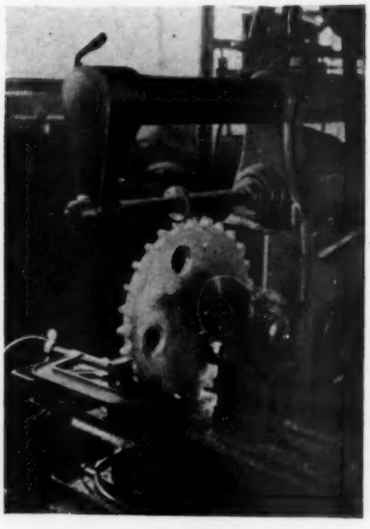
It seems as though most things were invented some time before the times were ripe for their practical use. Perhaps the most shining example is that of Leonardo de Vinci who seems to have had a glimmering idea of many of our modern machines. Getting down to more modern times we have the early centerless grinding of Cumberland shafting, spasmodic applications of broaching and direct applications of local hardening to gear teeth. The first use of this that came to our notice was to starter teeth in the cast-steel flywheel of the Pierce-Arrow motor, something over ten years ago. Teeth cut in cast-iron gears had the habit of breaking out at inopportune times. So cast steel was tried, with local hardening. Then the separate starter came to be regular practice. Now we have commercial apparatus available for hardening teeth of large gears to increase their wear life.

Making Sprocket Patterns In a Small Shop

CHESTER H. FRANKLIN

Link chain belts of the Ewart type are largely used in a variety of machinery found in sections remote from manufacturing districts. This includes power transmission in lumber and wood-working plants, citrous-fruit packing houses and phosphate mining.

The illustrations show the finishing of an aluminum pattern for such a sprocket in a No. 2 Becker-Brainard milling machine in the shop of McKinney & Moore, Orlando, Fla. The small cutter shown is finishing the radius at the bottom of the tooth,



9" x 3' South Bend Quick Change Gear Underneath Belt Motor Driven Precision Lathe on a manufacturing operation.

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Write FOR BULLETIN

Bulletin No. 9-C illustrates, describes and prices the different models of the 9-inch lathe. Copy sent free, upon request.

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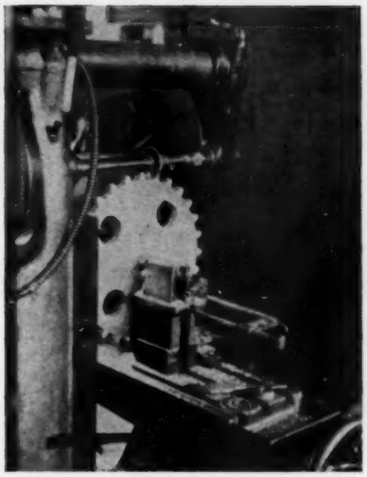

and great care is being taken to secure the proper form. The size of the sprocket can be judged by the elevation of the index centers.

Indexing was done very carefully and the sprocket was then clamped by the C-clamp shown, against an angle plate on the base of the dead center.

TRADE PUBLICATIONS

AUTOMOBILE FACTS AND FIGURES. Automobile Manufacturers Association, Inc., 366 Madison Ave., New York, N. Y., has published the 1937 edition of "Automobile Facts and Figures." This edition gives figures for the calendar year 1936 that are of particular interest to automobile manufacturers and users.

BRAZING FURNACES. Firth "Braze-Rite" furnaces for brazing of carbide-tipped tools are described in a 6-page bulletin announced by Firthite Div., Firth-Sterling Steel Co., McKeesport, Pa. Method of using these furnaces for brazing tipped tools is discussed in detail.

COUNTERBORES. Standard and special cutting tools, including counterbores, milling cutters and broaches, are described in Catalog No. CT-537 offered by Continental Tool Works Div., Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit. Standard and adjustable counterbore holders are also shown.

DIE SETS. A catalog listing precision die sets is offered by F. C. Danneman Co., 203 Lafayette St., New York. The new Style A die set is included in this catalog. Engineering data for the tool and die designer are given.

FLEXIBLE-SHAFT TOOLS. Single- and multiple-speed flexible shaft machines for grinding, buffing, screw driving and nut setting operations are described in Catalog M.S.T. announced by The Charles L. Jarvis Co., Middletown, Conn. Various accessories and rotary files are also listed.

FURNACE CONTROL. Wheelco Instruments Co., 1933 South Halsted St., Chicago, Ill., has issued an 8-page bulletin, No. 1101 on the Model 1101 "Flame-otrol", a gas-burner safety device designed to prevent explosion by shutting off the gas in case of flame failure.

HARD-FACING. A new edition of the booklet "Hard-Facing With Haynes Stellite Products" has been published by Haynes Stellite Co., Kokomo, Ind. This booklet describes more than 500 applications of the hard-facing process and gives data regarding J-Metal cutting tools for turning and boring operations.

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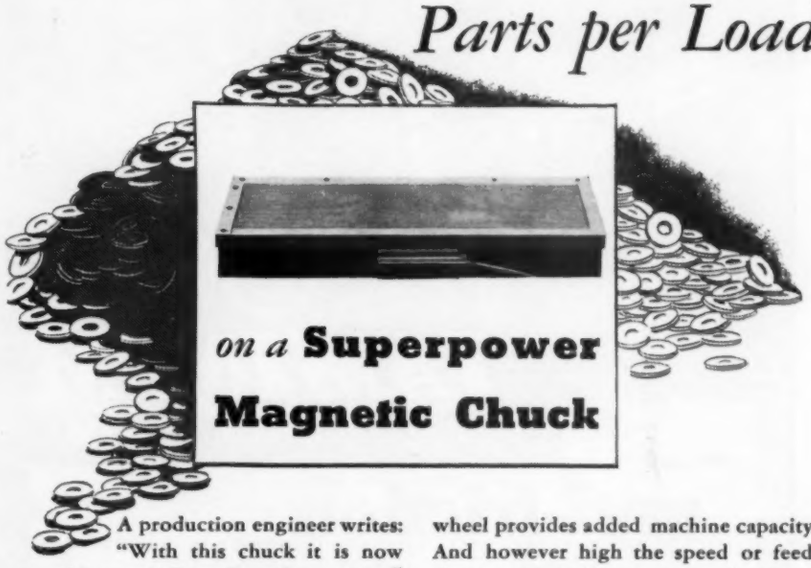

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Patented surge-control switch protects windings... prolongs chuck life.

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HYDRAULIC EQUIPMENT. Catalog No. H-37, offered by The Tomkins-Johnson Co., 617 N. Mechanic St., Jackson, Mich., lists and describes hydraulic cylinders, power units and special equipment. Includes engineering data of interest.

"K" MONEL. Bulletin No. T-9 revised, as of July 1937, by The International Nickel Co., Inc., 67 Wall St., New York, gives technical information on the engineering properties of "K" monel metal.

LUBRICATION ACCESSORIES. More than 1,000 styles and sizes of oil cups, oil and grease seals, oil cans and other lubrication accessories are listed in a catalog offered by Gits Bros. Mfg. Co., 1846–62 Kilburn Ave., Chicago.

PORTABLE ELEVATORS. Folder No. 508, offered by Lewis-Shepard Co., 117 Walnut St., Watertown, Mass., describes the uses of stackers, tiering machines and portable elevators suitable for piling goods and products from floor to ceiling.

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PULLEYS. An 8-page illustrated price list, Catalog No. 1622, is offered by Link-Belt Co., 307 N. Michigan Ave., Chicago, on the subject of cast-iron pulley for power transmission. Pertinent data on solid and split, single and multiple arm machine-molded pulleys are given.

RAILROAD PINS AND BUSHINGS. Catalog No. RR-437, announced by Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, lists hardened and ground steel pins for locomotive, tender and car maintenance.

SPEED REDUCERS. Worm-gear and herringbone-gear speed reducers are listed in a 72-page catalog offered by Foote Gear Works, Inc., 1301 S. Cicero Ave., Chicago. Flexible couplings are also listed.

TEST INDICATORS. A mailing folder by Federal Products Corp., 1144 Eddy St., Providence, R. I., talks about the Model 2 test indicator with universal holding bar.

THE CASH BUDGET. Policyholders Service Bureau, Metropolitan Life Insurance Co., 1 Madison Ave., New York, N. Y., has announced publication of a report, entitled "The Cash Budget," which summarizes methods followed by some 45 companies engaged in 20 different industries.

TOOL GRINDERS. Catalog No. CG-436, by Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, describes in detail the features of Model 44, 46, 47 and 47 carbide tool grinders. Rapid grinding technique, developed for use with carbide-tipped tools, is discussed.

V-BELT TESTING. Working drawings have been prepared from which a machine may be constructed to test V-Belts by methods given in the new SAE Standard for V-Belts and Pulleys (1937 SAE Handbook, pages 60-63). These drawings, No. 7-7-10 and No. 7-7-11, are available to members of the Society at 50 cents per set; to non-members at $1 per set. Orders should be addressed to Standards Dept., Society of Automotive Engineers, 29 West 39th St., New York, N. Y.

WELDING MANUAL. A revised edition of the "Arc Welding Manual and Operator's Training Course" has been announced by Hobart Brothers Co., Canal Lock Square, Troy, Ohio. This 94-page booklet includes considerable arc welding data as well as instructions for proper welding methods. Offered to readers of American Machinist at special price of 50 cents per copy.